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WAR MACHINE

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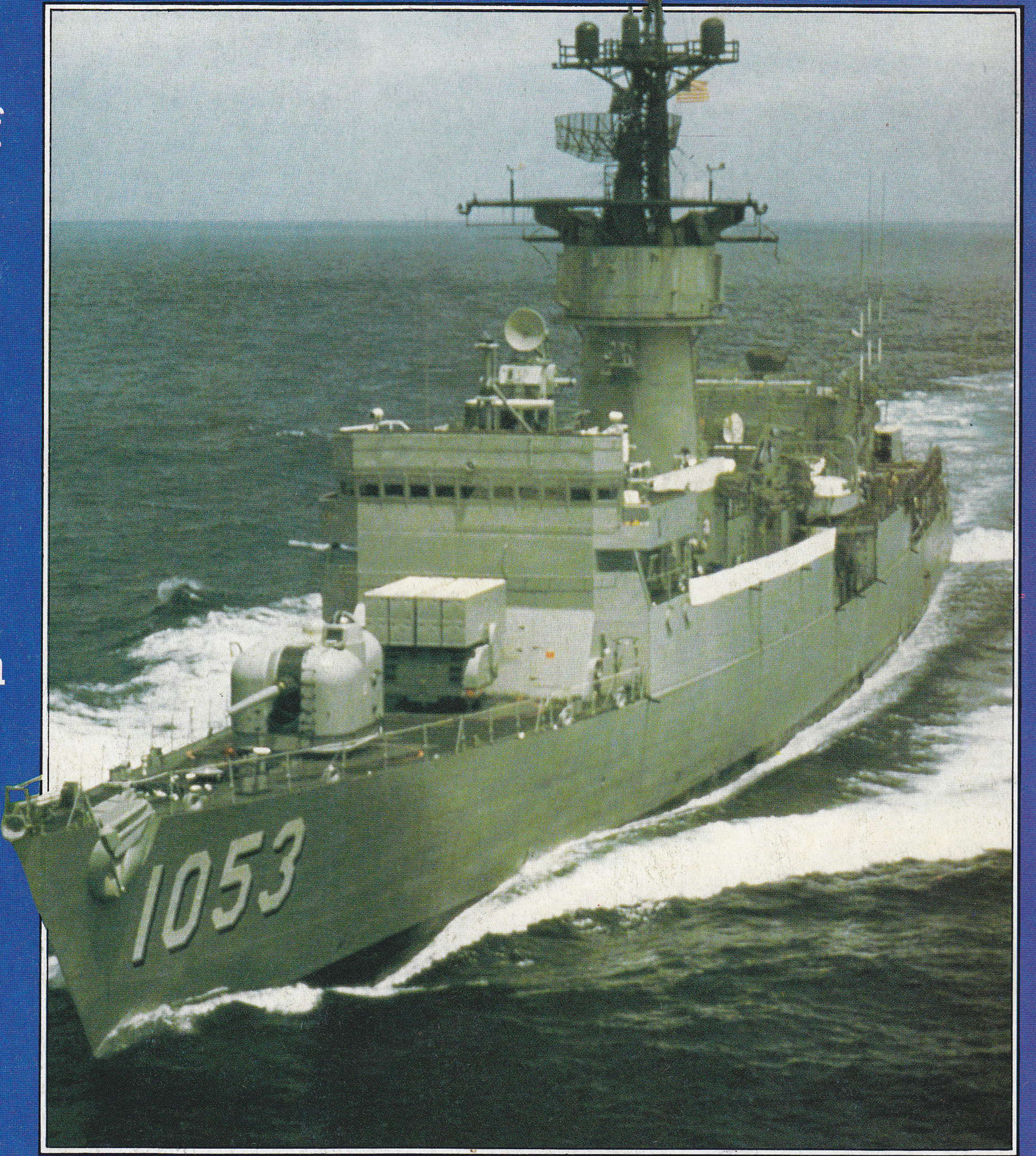

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Sonar Types

Type 21 in Action

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A fully illustrated guide to Modern Western Frigates

WAR MACHINE

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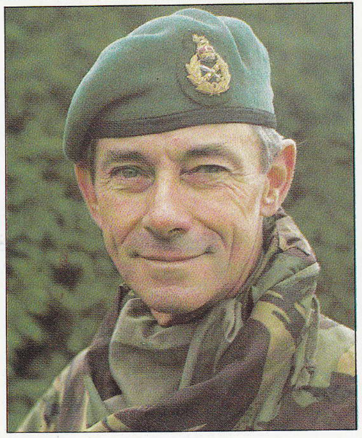

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Modern Western Frigates

Second of the 46-strong 'Knox' class, USS Roark (FF1053) typifies US frigate design. Although as large and capable as many destroyers, the class's single-shaft propulsion and lower speeds lead to it being classified as a frigate.

Over the centuries, the frigate has performed a wide variety of tasks, ranging from the classic 'eyes of the fleet' of Nelson's day to the suppression of the U-boat menace in the Battle of the Atlantic of World War II. Today, the name covers a wide variety of vessels.

The frigate has become the 'workhorse' of current Western navies. The term is applied to vessels ranging from the very expensive and highly specialized ASW ships of the Royal Navy's Type 22 design to what are essentially the cheap and reduced-capability 'Knox' and 'Oliver Hazard Perry' classes of the US Navy, which are used instead of specialized ASW and AAW destroyers and cruisers to escort convoys and groups of amphibious warships.

To counter the modern nuclear-powered submarine the frigate should have gas turbine propulsion and two shafts fitted with controllable-pitch propellers, both features of most western European designs. However, the Americans accept a lower maximum speed and only one shaft, which has lead to some criticism. Some European nations such as West Germany and the Netherlands have also got together to produce a standard frigate design for their navies, which in these countries has manifested itself as the 'Bremen' and 'Kortenaer' classes respectively. Further to help standardization, Greece has bought two of the Dutch ships and may build another three under licence. Of the two American designs ('Knox' and 'Oliver Hazard Perry') only Spain among the NATO countries has bought any, licence-building five and three respectively. However, in terms of exporting their designs it is the Italians who have now taken the lead with their 'Lupo' class, which has been sold to three nations outside NATO in South America and the Middle East. The Italians themselves have taken four 'Lupos' and eight of the ASW 'Maestrale' class variant. France rates her frigates as *avisos* (sloops) and generally uses them on overseas patrols as a modern gunboat 'showing the flag'. The Japanese frigate is predominantly an ASW vessel for use in Japanese waters. In the Royal Navy the frigate was until the beginning of the 1970s primarily a general-purpose warship, as the 'Leander' class proved, but since then it has been either converted into or built as a specialist vessel to tackle either sub-surface, surface or anti-air warfare tasks. The latest British frigate design is the Type 23 'Daring' class, the first of which is still to be ordered after several years of planning.

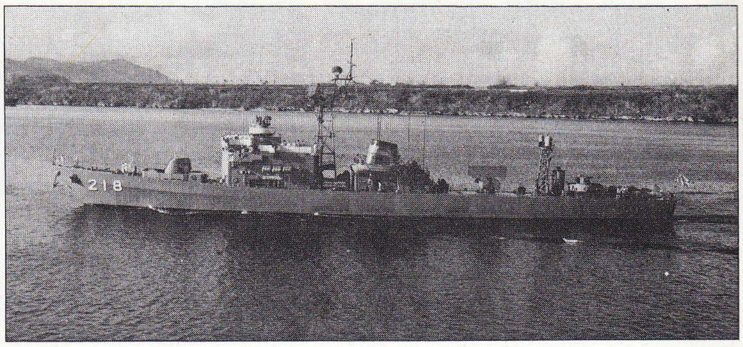
For the long term a NATO standard frigate hull is under discussion, but like most alliance projects it is expected the outcome will probably be that consortium members will break up into groups and individuals, each going their own way.

HNLMS De Ruyter*, a 'Tromp' class frigate of the Royal Netherlands navy, is accompanied by the 'Kortenaer' class frigate HNLMS* Van Kinsbergen *in the North Sea. The two 'Tromp' class vessels serve as flagships and carry a comprehensive weapon fit.*

JAPAN

'Chikugo' class

Designed and built with structural features to reduce noise and vibration, the **'Chikugo' class** ships are used primarily for coastal ASW missions around the Japanese home islands. To facilitate their use in this role they are gradually being equipped to carry and operate the SQS35(J) variable-depth sonar from an open well offset to starboard at the stern. They are also the smallest warships in the world to carry the octuple ASROC ASW missile-launcher system, though no reloads are carried; the amidships launcher is trained to the bearing and then elevated to fire a two-round salvo of the solid-fuel RUR-5A rockets with their Mk 46 parachute-retarded homing torpedo payloads out to a maximum range of 9.2 km (5.7 miles). The Japanese vessels do not carry the alternative payload of a 1-kiloton Mk 17 nuclear depth charge carried by American ships. The propulsion plant comprises either four Mitsubishi-Burmeister & Wain UEV30/40 (in DE 215, 217-219, 221, 223 and 225) or four Mitsui 28VBC-38 diesels (in the remainder). A Mk 51 fire-control director with no radar controls the twin 40-mm mount aft. The hull-mounted OQS3 sonar is a licence-built version of the American SQS-23 set, a variant of which is used on the 'Spruance' class ASW destroyers. The 11 vessels in service are the ***Chikugo*** (DE215), ***Ayase*** (DE216), ***Mikumo*** (DE217), ***Tokachi*** (DE218), ***Iwase*** (DE219), ***Chitose*** (DE220), ***Niyoda*** (DE221), ***Teshio*** (DE222), ***Yoshino*** (DE223), ***Kumano*** (DE224) and ***Noshiro*** (DE225).



Tokachi ***(DE218) pays a courtesy visit to Hawaii. As in all except the most recent Japanese designs, the*** *'Chikugo'* ***class has significant ASW capability but little in the way of surface-to-surface or AAW equipment.***

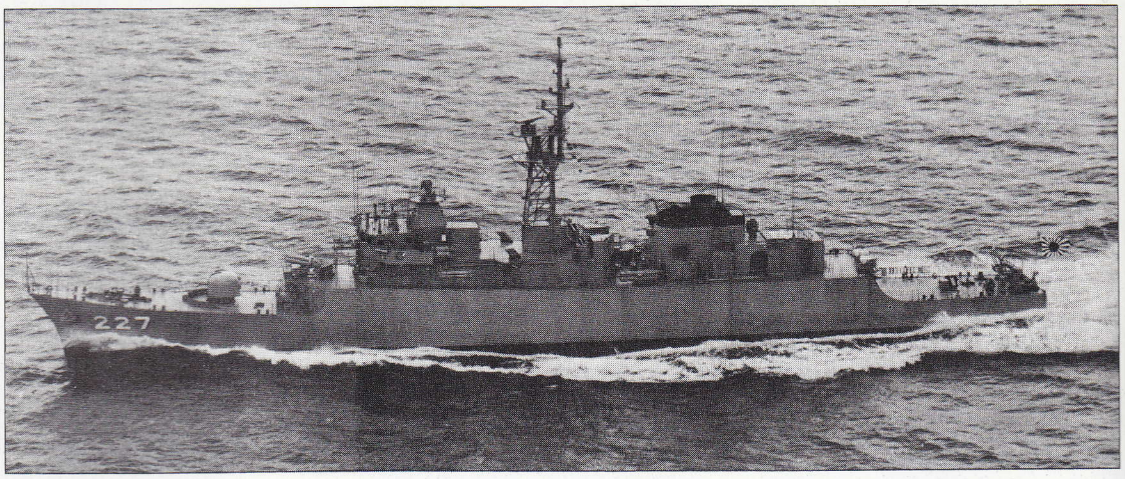
Specification
'Chikugo' class
Displacement: (DE215 and DE220) 1,480 tons standard, (DE216-DE219 and DE221) 1,470 tons standard or (DE222-DE225) 1,500 tons standard and 1,700-1,800 tons full load
Dimensions: length 93.1 m (305.5 ft); beam 10.8 m (35.5 ft); draught 3.5 m (11.5 ft)
Propulsion: four diesels delivering 16,000 hp (11931 kW) to two shafts
Speed: 25 kts
Armament: one twin 76-mm (3-in) Mk 33 DP gun, one twin 40-mm AA gun, one octuple ASROC ASW missile launcher with eight missiles, and two triple 324-mm (12.75-in) Mk 68 ASW torpedo tubes with Mk 46 torpedoes
Aircraft: none
Electronics: one OPS-14 air-search radar, one OPS-28 surface-search radar, one GCFS-1B fire-control radar, one OPS-19 navigation radar, one NORL-5 ESM system, one OQS-3 hull sonar, and one SQS-35(J) variable-depth sonar (being fitted)
Complement: 165

JAPAN

'Yubari' class

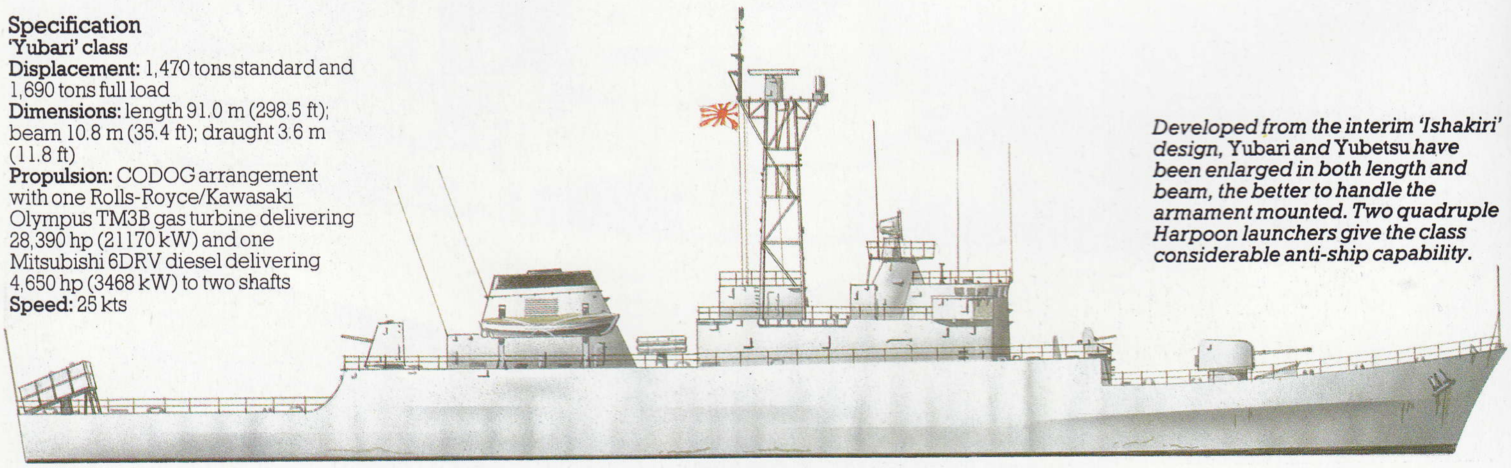
The **'Yubari' class** is basically an improved and enlarged variant of the 'Ishakiri' design authorized in 1977-8. The greater length and beam improved the seaworthiness and reduced the internal space constrictions of the earlier design. The original number of units to be built was three, but this was reduced by one when the Japanese government deleted funds from the naval budget in the early 1980s. A new three-vessel 'Improved Yubari' class is to be constructed in the 1983-7 five-year plan.

Although not heavily armed and having no helicopter facilities in comparison with contemporary European designs, the 'Yubaris' are ideal for use in the waters around Japan, where they would operate under shore-based air cover. Most of the weapons, machinery and sensors have been built under licence from foreign manufacturers. The propulsion plant is a CODOG arrangement with a licence-built Kawasaki/Rolls-Royce Olympus TM3B gas turbine and a Mitsubishi 6DRV 35/44 diesel. Extensive automation of the machinery has reduced the crew total to below 100, which is extremely good for a warship of this size. The vessels which comprise the class are the ***Yubari*** (DE227) and ***Yubetsu*** (DE228).



Smaller than the preceding 'Chikugo' class, the 'Yubari' class is highly automated, with a crew of under 100. Designed to operate under land-based air cover, the design has little AAW capability, although the Phalanx 20-mm close-in weapon system is being fitted.

Specification
'Yubari' class
Displacement: 1,470 tons standard and 1,690 tons full load
Dimensions: length 91.0 m (298.5 ft); beam 10.8 m (35.4 ft); draught 3.6 m (11.8 ft)
Propulsion: CODOG arrangement with one Rolls-Royce/Kawasaki Olympus TM3B gas turbine delivering 28,390 hp (21170 kW) and one Mitsubishi 6DRV diesel delivering 4,650 hp (3468 kW) to two shafts
Speed: 25 kts
Armament: two quadruple Harpoon surface-to-surface missile launchers with eight missiles, one 76-mm (3-in) DP gun, one 20-mm Phalanx CIWS (being fitted), one quadruple 375-mm (14.76-in) Bofors ASW rocket launcher, and two triple 324-mm (12.75-in) Mk 68 ASW torpedo tubes with Mk 46 torpedoes
Aircraft: none
Electronics: one OPS-28 surface-search radar, one OPS-19 navigation radar, one GFCS-1 fire-control radar, one NOLQ-6 ESM system, one OLT-3 ECM jammer, two Mk 36 Super RBOC chaff launchers, and one OQS-1 hull sonar
Complement: 98



Developed from the interim 'Ishakiri' design, Yubari *and* Yubetsu *have been enlarged in both length and beam, the better to handle the armament mounted. Two quadruple Harpoon launchers give the class considerable anti-ship capability.*

Sonar Types

Modern underwater detection systems have progressed a long way from the simple hydrophone and Asdic of the 1940s. While using the same principle of high frequency sound waves to detect targets under water, modern electronics give the equipment range and discrimination undreamt of in earlier years.

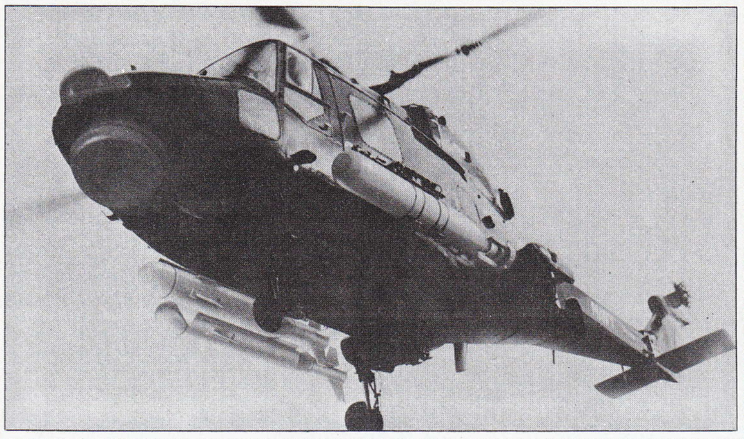
How well a sonar performs is effectively the limiting factor for almost all ASW systems apart from the non-acoustic detectors such as the Magnetic Anomaly Detector (MAD). Sonar systems are divided into passive and active types. The former uses the fact that any target submarine sends out a signal into the surrounding water mass in the form of radiated noise which can be picked up by a hydrophone receiver array (sonar) on the tracking vessel. For a successful detection the incoming signal must be sufficient in amplitude to be distinguishable against the background noise of the sea and any extraneous sounds made by the sonar platform itself. Modern processing equipment can accommodate very faint signals and, depending upon sea conditions, can detect targets at ranges well in excess of 161 km (100 miles). The ideal platform for the passive sonar is a submarine which operates below the noisy air-sea interface inhabited by the surface ship.

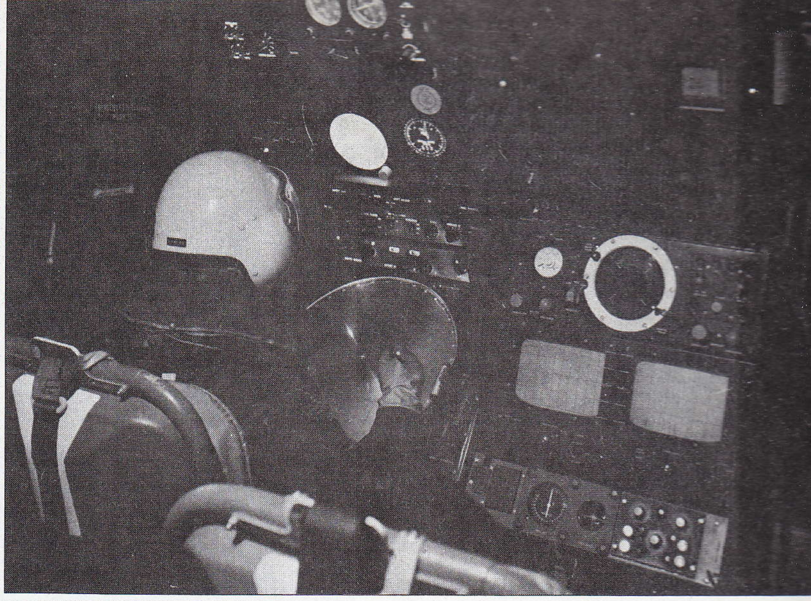
These latter craft tend to operate with active sonar, which is distinguishable by its frequencies, pulse patterns, power levels and other parameters. The sonar gear sends out an acoustic energy pulse or 'ping' into the surrounding water, and the receiver then waits for an echo reflected off the target: the rule of thumb for such sonars is that the lower the frequency used the greater the range for a given power level (and the greater the range the more the chance of its detection on a sonar transmission intercept system). However, to benefit from active sets the operator must use one or more of the operating modes. By far the slowest is known as the 'searchlight' technique, whereby the transducer which produces the 'ping' is fired in a given direction and the operator waits for a returning echo; if none arrives then he rotates the transducer to another bearing and repeats the process. The alternative to this is the omni-directional 'scanning' mode whereby the transducer remains stationary but a 'ping' is sent out simultaneously in all directions, thus considerably increasing the chance of target detection. In the most modern systems the 'ping' can be produced electronically to give sector-scanning capabilities and produce a rapid succession of intense beams for either a higher search rate or shorter-duration pulses. The latter are particularly useful for close targets as they can discriminate submarine manoeuvres.

The amount of power put into producing the 'ping' determines not only its range but also to what extent the sonar can exploit the alternative means of sound propagation there are in the ocean. For instance, short-range sets such as the British Type 184 or American SQS-56 employ a 'direct path' above-layer effect and are usually limited to ranges of less than 18300 m (20,000 yds) by the refraction of sound in seawater off the thermal layer. A higher-power set which can use electronic means to tilt the beam steeply downwards, however, may penetrate the shadow zone effect thus produced (which can mask a submarine at ranges of more than 1830 m/2,000 yds to the direct-path system) by passing the beam through the layer to reflect off the sea bed in what has become known as the 'bottom bounce' (BB) mode. Unfortunately the BB can only be used with suitably reflective sea bed surfaces.

Right: This Westland Lynx of the Royal Netherlands navy displays its dunking sonar. Once their sensors have detected the target, helicopters have an unrivalled ability to track submarines which can outrun surface ships. Developments in communication equipment enable sensor information to be rapidly disseminated between helicopters and ships.

Below: The Lynx 3 will carry a great range of sensors: active and passive sonobuoys, dunking sonar and a magnetic anomaly detector. The latter identifies changes in the Earth's magnetic field caused by large metal objects such as submarines.

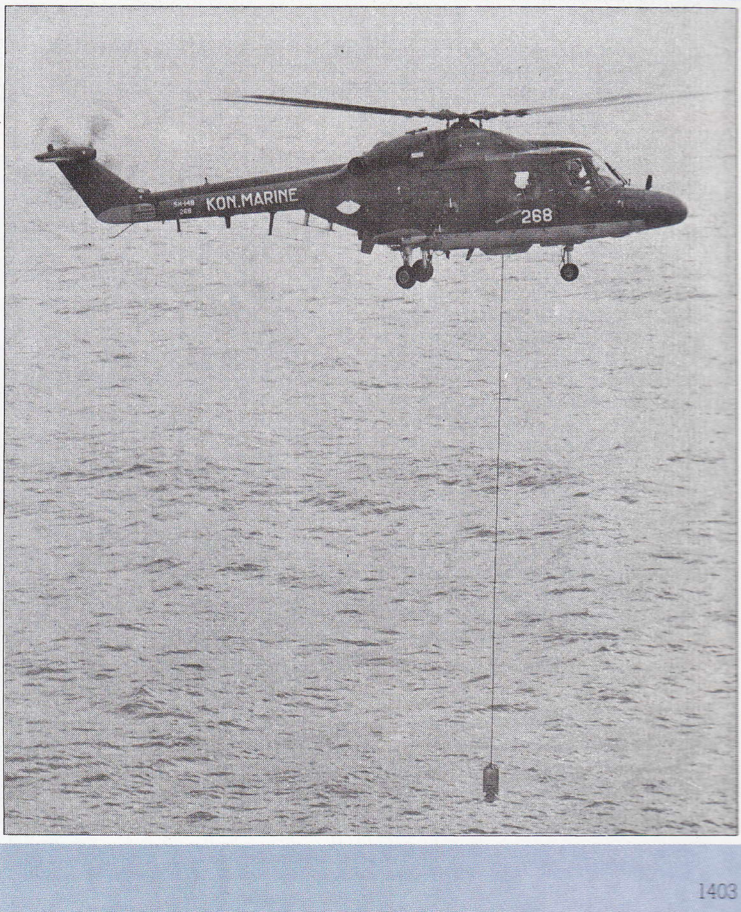




The hunt for enemy submarines involves the use of detection systems mounted in ships, submarines and, in this case, a helicopter, each sensor platform having its advantages and disadvantages. The already complex war of rival technologies is rendered doubly so by the very nature of the ocean.

Another way in which the high-power systems such as the American SQS-26 and British Type 2016 can detect submarines is by utilizing the refraction of the sonar beam itself in deep water to give very long detection ranges. The beam sent out is bent down and then up by the seawater conditions to concentrate in what is known as a 'Convergence Zone' (CZ) which is a circular area a few miles wide produced at a distance from the ship. Exactly how far away it is depends strictly upon the sea conditions and water temperature in the area. Further CZs are repeated at equal distances, so forming a series of concentric circles around the platform. This mode provides a reliable range if the target is within a CZ, but the bearing accuracy is not as good. This disadvantage was initially overcome by the use of ASROC and SUBROC nuclear-tipped ASW weapons out to the first CZ, and the development of the ASW Stand-Off Weapon (with a nuclear or homing torpedo payload) is now due to take the possible engagement range out to the third CZ and beyond.

Submarines also employ a surface reflection technique which, by comparing the returns from BB and CZ signals, can give a remarkably accurate target depth. They, and increasingly surface ships, now overcome the thermal layer problem by using a towed-array sonar streamed beneath it. Operating passively, the system has extremely long detection ranges. Surface ships also overcome the layer by using a variable-depth sonar (VDS), which is an active transducer towed in a body behind the ship at a depth usually below the layer.

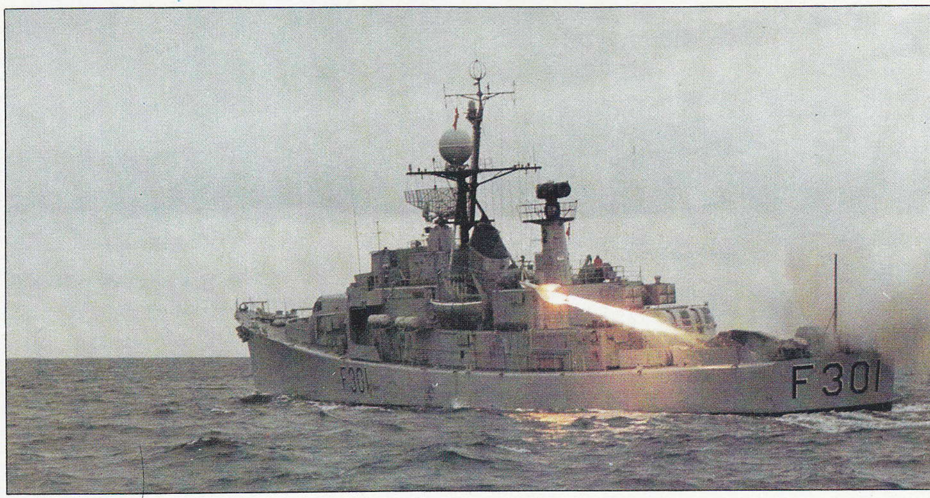


NORWAY

'Oslo' class

Based on the US 'Dealey' class destroyer escorts, the **'Oslo' class** frigates have a higher freeboard forward (to suit the sea conditions off Norway) and many European-built subsystems. They were built under the 1960 five-year naval plan, with half the cost borne by the USA. The class underwent modernization refits in the late 1970s, these including the fitting of Penguin Mk 2 SSMs, a NATO Sea Sparrow SAM launcher and Mk 32 ASW self-defence torpedo tubes. A replacement class is being designed for possible construction in the 1990s.

Currently the largest surface combatants in the Norwegian navy, the 'Oslos' provide the only major ASW force in the region. For this role they carry a forward-mounted sextuple rocket-launcher with a rapid reload capability for the 370 to 825-m (405 to 900-yard) range Terne III ASW rocket. This is a 120-kg (265-lb) weapon fitted with a combination depth and proximity Doppler fuse for its 6.1-m (20-ft) lethal radius 48-kg (105.8-lb) HE warhead; the target depth can be between 15 and 215 m (50 and 705 ft). Once fired the launcher is automatically trained to the vertical and reloaded within 40 seconds. The ships' SQS-36 sonar acts as the search unit whilst the Terne Mk 3 attack sonar is used for target range and depth determinations. For self defence the ships have the American 45-kt 11-km (6.8-mile) range Mk 46 acoustic-homing torpedo fired from the Mk 32 torpedo tubes. The five ships in service are the ***Oslo*** (F300), ***Bergen*** (F301), ***Trondheim*** (F302), ***Stavanger*** (F303) and ***Narvik*** (F304).



The 'Oslo' class frigate* Bergen *(F301) is seen firing a Penguin surface-to-surface missile.

Specification

'Oslo' class

Displacement: 1,450 tons standard and 1,850 tons full load

Dimensions: length 96.6 m (316.9 ft); beam 11.2 m (36.7 ft); draught 4.4 m (14.4 ft)

Propulsion: geared steam turbines delivering 20,000 hp (14914 kW) to one shaft

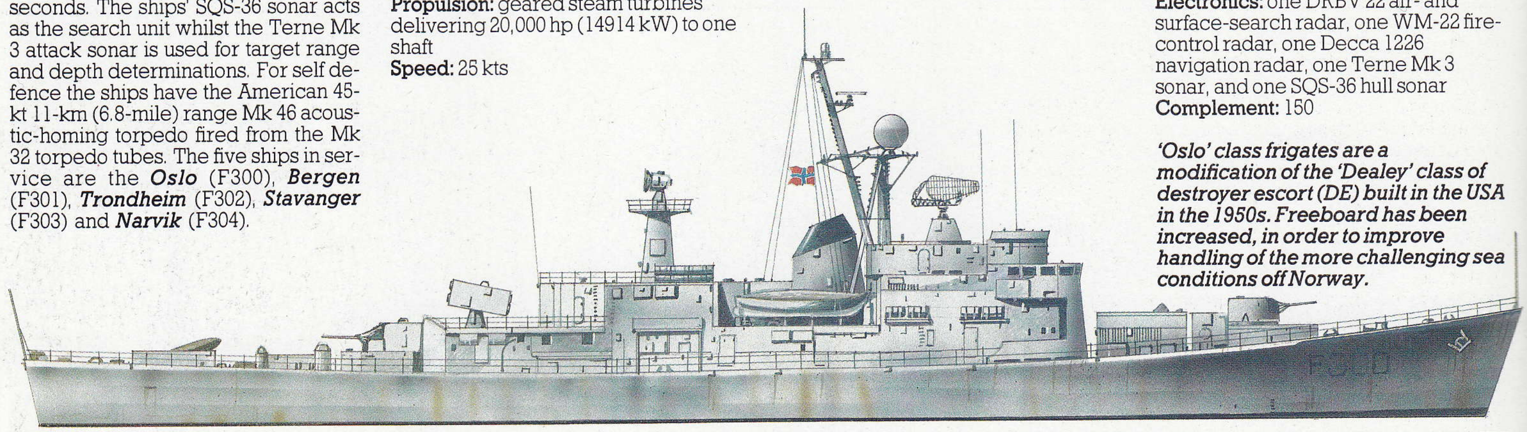
Speed: 25 kts

Armament: six single Penguin Mk 2 surface-to-surface missile launchers with six missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with 24 missiles, two twin 76-mm (3-in) Mk 33 DP guns, one sextuple Terne ASW rocket launcher, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes

Aircraft: none

Electronics: one DRBV 22 air- and surface-search radar, one WM-22 fire-control radar, one Decca 1226 navigation radar, one Terne Mk 3 sonar, and one SQS-36 hull sonar

Complement: 150



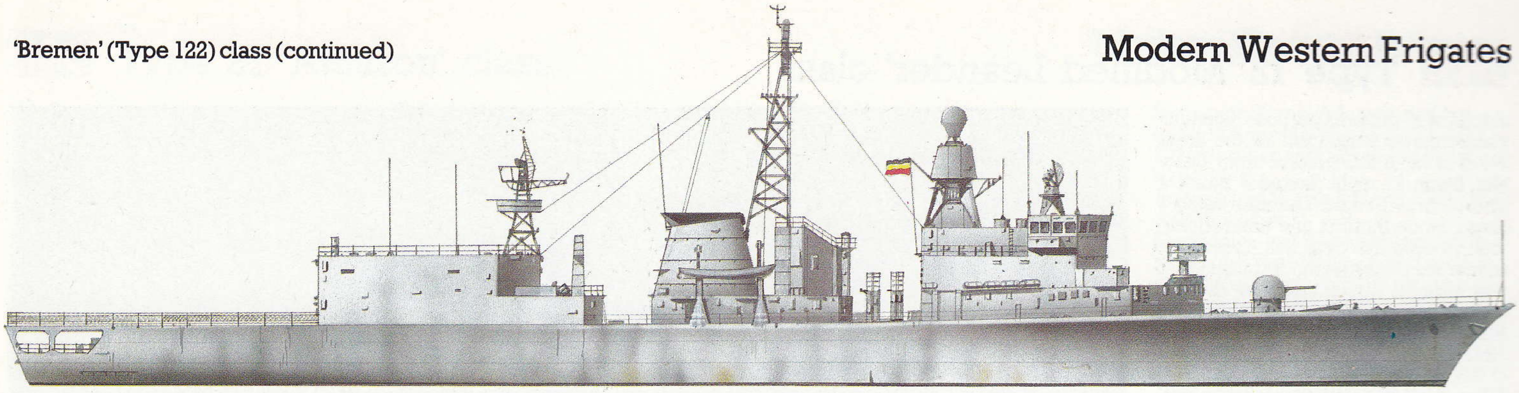
'Oslo' class frigates are a modification of the 'Dealey' class of destroyer escort (DE) built in the USA in the 1950s. Freeboard has been increased, in order to improve handling of the more challenging sea conditions off Norway.

WEST GERMANY

'Bremen' (Type 122) class

A Germanized modification of the gas turbine-powered Dutch 'Kortenaer' design, the six-ship **'Bremen' class** is replacing the deleted 'Fletcher' (Type 119) class destroyers and the elderly 'Köln' (Type 120) class frigates. The hulls are mated with the propulsion plant in the building yards, and are then towed to Bremer Vulkan, where the weapon systems and electronics are fitted. The first order was placed in 1977, and the ship eventually commissioned in May 1982 after government approval had been given for the construction in 1976. A further two units were subsequently cancelled as a result of cost problems. The ships are fitted with fin stabilizers and the American Praerie/Masker bubble system on the hull and propellers to reduce radiated noise levels from the machinery spaces. A complete NBC defence

Bremen *(F207) is the first of a class of six frigates for the Bundesmarine. These general-purpose vessels carry their main anti-submarine punch in the two Lynx helicopters with which each ship is equipped.*



Developed from the Dutch 'Kortenaer' class of frigate, the 'Bremen' class has the same hull form and minor differences in armament. The major alteration is in the provision of diesel cruising engines in place of the turbines of the 'Kortenaer' class.

citadel system is also fitted. Two of the new passive radar/infra-red terminal homing 24-round RAM point-defence SAM launchers are to be installed atop the hangar in the near future. The ASW helicopters carried are Westland Lynx HAS.Mk 88s, which differ from Royal Navy machines in having an active Bendix DASQ-18 dunking sonar for use with the Mk 46 homing torpedoes and Mk 54 depth charges they carry. For flying in rough weather the ships are fitted with the Canadian Bear Trap landing system.

The six ships are the ***Bremen*** (F207), ***Niedersachsen*** (F208), ***Rheinland-Pfalz*** (F209), ***Emden*** (F210), ***Köln*** (F211) and ***Karlsruhe*** (F212), and all are now in service; plans call for them to remain in the front line into the 21st century.

Specification

'Bremen' class

Displacement: 2,900 tons standard and 3,750 tons full load

Dimensions: length 130.5 m (428.1 ft); beam 14.4 m (47.25 ft); draught 6.0 m (19.7 ft)

Propulsion: CODOG arrangement with two General Electric/FIAT LM2500 gas turbines delivering 51,600 hp (38478 kW) and two MTU 20V TB92 diesels delivering 10,400 hp (7755 kW) to two shafts

Speed: 32 kts

Armament: two quadruple Harpoon surface-to-surface missile launchers with eight missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with 24 RIM-7M missiles, two 24-round RAM point-defence surface-to-air missile launchers with 48 missiles (being fitted), one 76-mm (3-in) DP gun, and four single Mk 32 324-mm (12.75-in) ASW torpedo tubes for Mk 46 torpedoes

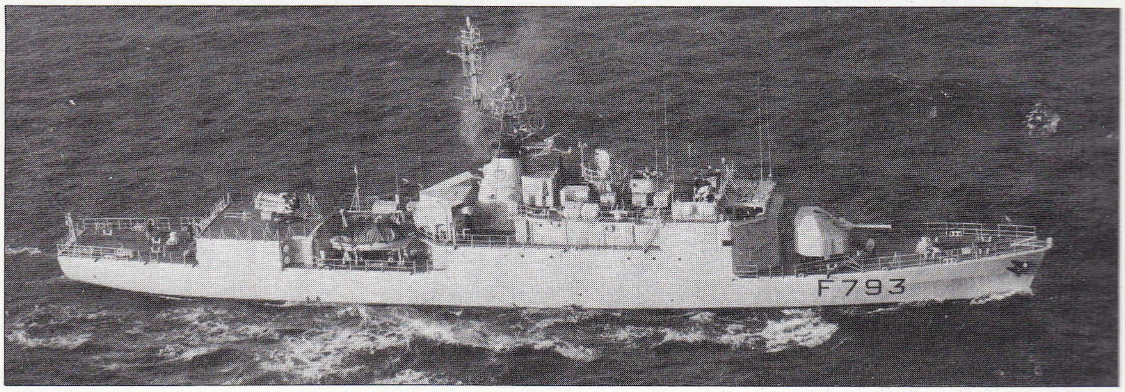
Aircraft: two Westland Lynx HAS.Mk 88 ASW helicopters

Electronics: one DA-08 air- and surface-search radar, one WM-25 fire-control radar, one STIR fire-control radar, one 3RM20 navigation radar, one SATIR tactical data system, one FL1800S ESM intercept system, four Mk 36 Super RBOC chaff launchers, and one DSQS-21B(Z) bow sonar

Complement: 204 normal and 225 maximum

FRANCE

'D'Estienne d'Orves' (A-69) class



Classed as an aviso, or coastal escort, **Commandant Blaison** ***is one of the most recent of the A-69 series to enter service. All the class have Exocet capacity, though the weapons are not always shipped.***

Designed for coastal ASW, the **'D'Estienne d'Orves' class** can also be used for scouting missions, training and for 'showing the flag' overseas, for which role a total of one officer and 17 men from the naval infantry can be accommodated. Since entering service in the mid-1970s the design has been sold to the Argentine navy, whose three ships the ***Drummond*** (P1), ***Guerrico*** (P2) and ***Granville*** (P3) saw service in the 1982 Falklands war. In this campaign the *Guerrico* suffered the ignominy of being damaged by shore fire from small arms and anti-tank rocket-launchers during the Argentine seizure of South Georgia on 3 April; this required her to be dry-docked for three days for repairs to the hull and armament.

Rated as *avisos* by the French, the first of the class was laid down at Lorient Naval Dockyard in 1972 and commissioned into service in 1976. Under present French navy plans the first three vessels built will be paid off in 1996, the other 14 units being decommissioned at regular intervals until 2004. All 17 vessels were built at Lorient, but at present ship a number of armament fits. Six vessels serve in the Mediterranean, eight in the Atlantic and three with the Channel squadron.

The class consists of the ***D'Estienne d'Orves*** (F781), ***Amyot D'Inville*** (F782), ***Drogou*** (F783), ***Détroyat*** (F784), ***Jean Moulin*** (F785), ***Quartier Maître Anquetil*** (F786), ***Commandant de Pimodan*** (F787), ***Second Maître de Bihan*** (F788), ***Lieutenant de Vaisseau Le Henaff*** (F789), ***Lieutenant de Vaisseau Lavalle*** (F790), ***Commandant l'Herminier*** (F791), ***Premier Maître l'Her*** (F792), ***Commandant Blaison*** (F793), ***Enseigne de Vaisseau Jacoubet*** (F794), ***Commandant Ducuing*** (F795), ***Commandant Birot*** (F796) and ***Commandant Bouan*** (F797).

Specification

'D'Estienne d'Orves' class

Displacement: 1,100 tons standard and 1,250 tons full load

Dimensions: length 80.0 m (262.5 ft); beam 10.3 m (33.8 ft); draught 5.3 m (17.4 ft)

Propulsion: two SEMT-Pielstick 12PC2 diesels delivering 11,000 hp (8203 kW) to two shafts; in F791 two SEMT-Pielstick 12PA6BTC diesels delivering 14,400 hp (10738 kW)

Speed: 24 kts

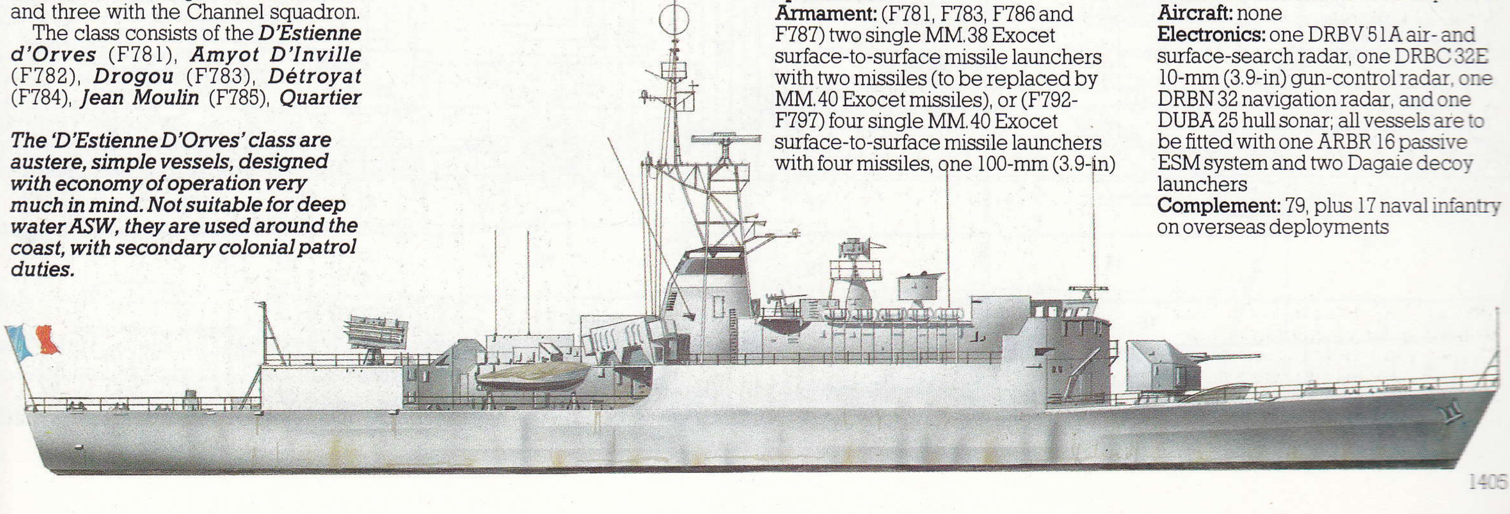
Armament: (F781, F783, F786 and F787) two single MM.38 Exocet surface-to-surface missile launchers with two missiles (to be replaced by MM.40 Exocet missiles), or (F792-F797) four single MM.40 Exocet surface-to-surface missile launchers with four missiles, one 100-mm (3.9-in) DP gun, two single 20-mm AA guns, one sextuple 375-mm (14.76-in) Creusot Loire ASW rocket-launcher, and four single ASW torpedo launchers with four L3 or L5 torpedoes

Aircraft: none

Electronics: one DRBV 51A air- and surface-search radar, one DRBC 32E 10-mm (3.9-in) gun-control radar, one DRBN 32 navigation radar, and one DUBA 25 hull sonar; all vessels are to be fitted with one ARBR 16 passive ESM system and two Dagaie decoy launchers

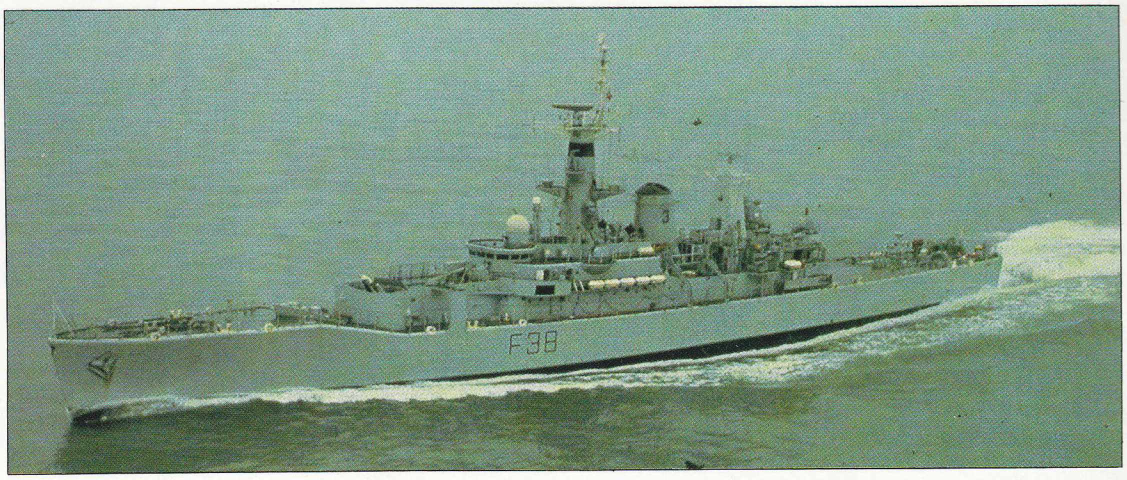
Complement: 79, plus 17 naval infantry on overseas deployments

The 'D'Estienne D'Orves' class are austere, simple vessels, designed with economy of operation very much in mind. Not suitable for deep water ASW, they are used around the coast, with secondary colonial patrol duties.



UK

Type 12 'Modified Leander' class



Completed in 1965, HMS* Arethusa *was converted to carry an Ikara ASW rocket-launcher during a major refit completed in 1977. Eight of the original Batch 1 'Leander' class vessels have been altered in this way.

A total of 26 general-purpose **'Leander' class** frigates were built for the Royal Navy in three sub-groups: eight **'Leander Batch 1'**, eight **'Leander Batch 2'** and 10 broad-beam **'Leander Batch 3'** ships. Since the first unit entered service in 1963 the class has undergone numerous refits and modernizations so that today it can actually be divided into six separate sub-classes. The five Batch 3 ships HMS ***Andromeda*** (F57), HMS ***Hermione*** (F58), HMS ***Jupiter*** (F60), HMS ***Scylla*** (F71) and HMS ***Charybdis*** (F75) have undergone conversion by the addition of a GWS25 Sea Wolf automatic point-defence missile system plus numerous new sensor systems to give the most capable of the sub-classes. The conversion of the remaining five Batch 3 units to this configuration was shelved because of the usual economic reasons. One of them, the ex-*Bacchante*, has since been sold to New Zealand as HMNZS ***Wellington*** (F69) to join an existing 'broad-beam' HMNZS ***Canterbury*** (F421) and the standard version HMNZS ***Waikato*** (F55). The remaining four units are HMS ***Achilles*** (F12), HMS ***Diomede*** (F16), HMS ***Apollo*** (F70) and HMS ***Ariadne*** (F72), which still retain their 114-mm (4.5-in) gun and Sea Cat SAM armament. The Batch 2 units were due to form a single Exocet-armed class, but this has now changed to three different types. The first comprises HMS ***Cleopatra*** (F28), HMS ***Sirius*** (F40), HMS ***Phoebe*** (F42) and HMS ***Minerva*** (F45), and is known as the **'Batch 2 Towed Array Exocet Group'** as the ships have been fitted with the Type 2031(I) general-purpose surveillance and tactical towed-array sonar on the starboard side of the stern. Three of the remaining Batch 2 vessels are HMS ***Danae*** (F47), HMS ***Argonaut*** (F56) and HMS ***Penelope*** (F127) which now form the original Exocet conversion group with the twin Mk 6 114-mm (4.5-in) gun mount replaced by four MM.38 Exocet launchers and a third GWS22 Sea Cat SAM launcher. The last Batch 2 ship, HMS ***Juno*** (F52), had her Exocet conversion halted and is now converting to serve as the fleet's navigation training ship.

The eight Batch 1 vessels were converted to ASW ships by the fitting of a GWS40 Ikara ASW missile installation in place of the gun mount. To compensate for the loss in AA capability a second GWS22 Sea Cat launcher was added aft atop the hangar. One vessel, the ex-*Dido* has been sold to New Zealand as HMNZS ***Southland*** (F104), whilst the other seven remain in RN service; these are HMS ***Aurora*** (F10), HMS ***Euryalus*** (F15), HMS ***Galatea*** (F18), HMS ***Arethusa*** (F38), HMS ***Naiad*** (F39), HMS ***Ajax*** (F114) and HMS ***Leander*** (F109). However, their remaining service time would appear short if reports concerning the phase-out of the Ikara system are true.

In addition to the vessels for the Royal Navy, a number of other nations have either purchased British-built 'Leanders' or constructed their own under licence. These latter include the Australian HMAS ***Swan*** (D50) and HMAS ***Torrens*** (D53), the Indian navy ***Nilgiri*** (F33), ***Himgiri*** (F34), ***Udaygiri*** (F35), ***Dunagiri*** (F36), ***Taragiri*** (F41) and ***Vindhygiri*** (F42), and the Dutch ***Van Speijk*** (F802), ***Van Galen*** (F803), ***Tjerk Hiddes*** (F804), ***Van Nes*** (F805), ***Isaac Sweers*** (F814) and ***Evertsen*** (F815). The former vessels are the Chilean ***Condell*** (06) and ***Almirante Lynch*** (07). In all cases the countries obtained 'Leanders' with better armament and sensor fits than Royal Navy vessels, apart from the latest Sea Wolf conversions. The Dutch managed to double the surface-to-surface missile armament to eight by using the Harpoon, and the Indians managed to fit the last two of their vessels to carry Westland Sea King ASW helicopters.

Specification

'Leander' class (RN Sea Wolf conversion)

Displacement: 2,500 tons standard and 2,962 tons full load

Dimensions: length 113.4 m (372.0 ft); beam 13.1 m (43.0 ft); draught 4.5 m (14.8 ft)

Propulsion: geared steam turbines delivering 30,000 hp (22371 kW) to two shafts

Speed: 27 kts

Armament: four single MM.38 Exocet surface-to-surface missile launchers with four missiles, one sextuple GWS25 Sea Wolf surface-to-air missile launcher with 30 missiles, two single 20-mm AA guns, and two triple 324-mm (12.75-in) STWS1 ASW torpedo tubes with Mk 46 and Stingray torpedoes

Aircraft: one Westland Lynx HAS.Mk 2 ASW helicopter

Electronics: one Type 967/978 air- and surface-search radar, one Type 910 Sea Wolf fire-control radar, one Type 1006 navigation radar, one CAAIS combat data system, one UAA-1 ESM system, two Corvus chaff launchers, one Type 2016 hull sonar, and one Type 2008 underwater telephone

Complement: 260

Specification

'Van Speijk' class

Displacement: 2,255 tons standard and 2,835 tons full load

Dimensions: length 113.4 m (372.0 ft); beam 12.5 m (41.0 ft); draught 4.2 m (13.8 ft)

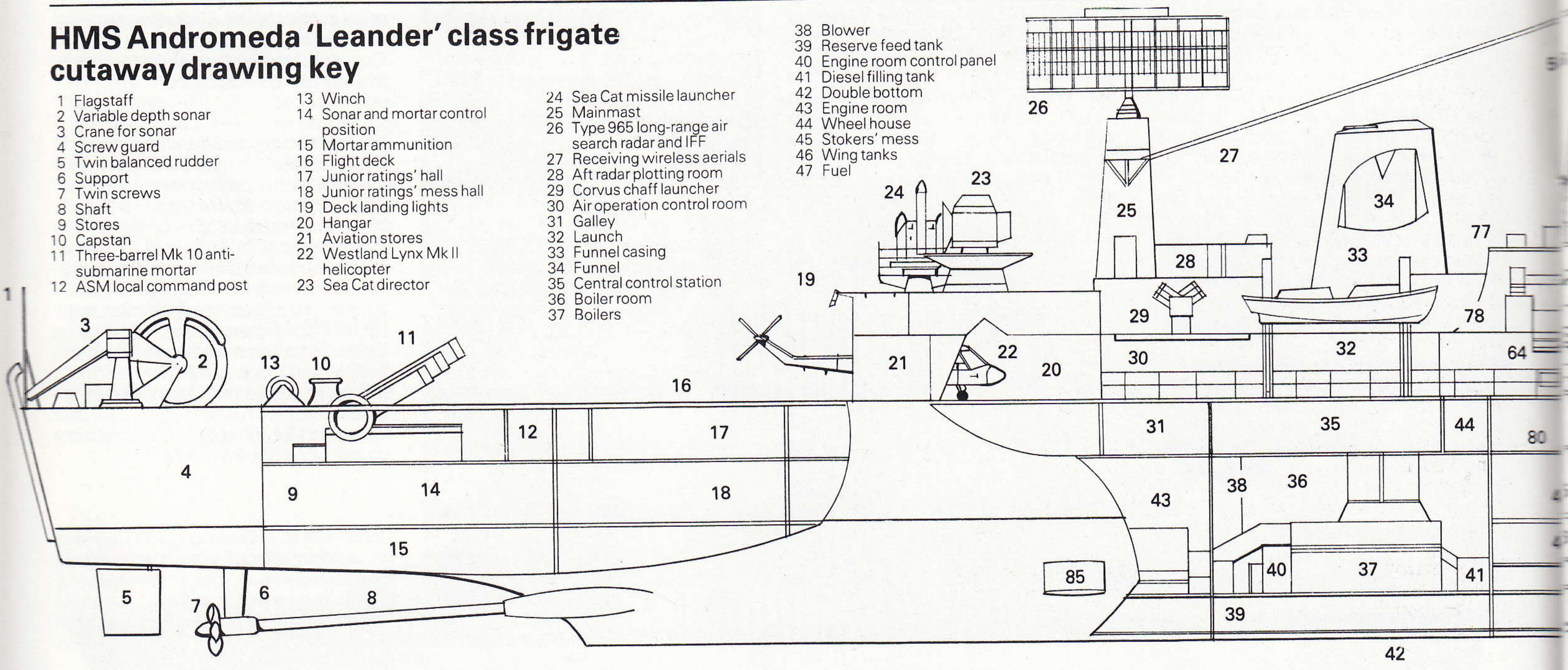
Propulsion: as 'Leander' class

Speed: 28.5 kts

Armament: two quadruple Harpoon surface-to-surface missile launchers

HMS Andromeda 'Leander' class frigate cutaway drawing key

1 Flagstaff
2 Variable depth sonar
3 Crane for sonar
4 Screw guard
5 Twin balanced rudder
6 Support
7 Twin screws
8 Shaft
9 Stores
10 Capstan
11 Three-barrel Mk 10 anti-submarine mortar
12 ASM local command post
13 Winch
14 Sonar and mortar control position
15 Mortar ammunition
16 Flight deck
17 Junior ratings' hall
18 Junior ratings' mess hall
19 Deck landing lights
20 Hangar
21 Aviation stores
22 Westland Lynx Mk II helicopter
23 Sea Cat director
24 Sea Cat missile launcher
25 Mainmast
26 Type 965 long-range air search radar and IFF
27 Receiving wireless aerials
28 Aft radar plotting room
29 Corvus chaff launcher
30 Air operation control room
31 Galley
32 Launch
33 Funnel casing
34 Funnel
35 Central control station
36 Boiler room
37 Boilers
38 Blower
39 Reserve feed tank
40 Engine room control panel
41 Diesel filling tank
42 Double bottom
43 Engine room
44 Wheel house
45 Stokers' mess
46 Wing tanks
47 Fuel



UK

Type 21 'Amazon' class

The **Type 21** or **'Amazon' class** general-purpose frigate was a private shipbuilder's design to replace the obsolete Type 41 or 'Leopard' and Type 61 or 'Salisbury' class frigates. Because of numerous bureaucratic problems, private and official ship designers were not brought together on the project, resulting in a class which handles well and is well liked by crews, but lacks sufficient 'growth' potential to take the new generation of sensor and weapon fits. Thus the vessels will not receive new equipment as such during their refit cycles. During the 1982 Falklands war HMS ***Avenger*** (F185), HMS ***Ardent*** (F184), HMS ***Antelope*** (F170), HMS ***Arrow*** (F173), and HMS ***Alacrity*** (F174) served in the main combat zone, whilst HMS ***Active*** (F171) and HMS ***Ambuscade*** (F172) assisted in supporting operations and the occasional shore bombardment. Only the lead ship, HMS ***Amazon*** (F169), missed the war as she was in the Far East. On 21 May 1982 the *Ardent* was so badly damaged in bomb attacks that she sank, whilst two days later the *Antelope* caught fire and exploded when an unexploded bomb that was being defused detonated aboard her. After the war the remaining class members were found to have suffered severe hull cracking; indeed one unit, *Arrow*, had to limp precariously home from the Falklands to enter emergency refit. All have now been strengthened with steel inserts welded to the hull structure, but the future of the class remains uncertain at present.

Specification

'Amazon' class

Displacement: 2,750 tons standard and 3,250 tons full load

Dimensions: length 117.0 m (384.0 ft); beam 12.7 m (41.7 ft); draught 5.9 m (19.5 ft)

Propulsion: COGOG arrangement with two Rolls-Royce Olympus TM3B gas turbines delivering 50,000 hp (37285 kW) and two Rolls-Royce Tyne RM1A gas turbines delivering 8,500 hp (6338 kW) to two shafts

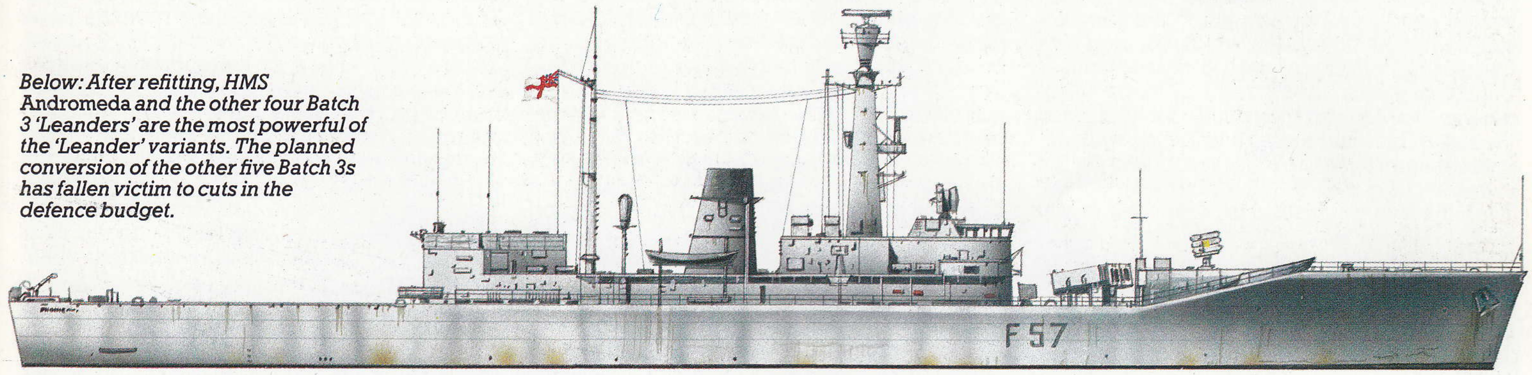
Speed: 32 kts

Armament: four single MM.38 Exocet surface-to-surface missile launchers with four missiles (not in F169 and F172), one quadruple GWS24 Sea Cat surface-to-air missile launcher with 20 missiles, one 114-mm (4.5-in) DP gun, four single 20-mm AA guns, and two triple 324-mm (12.75-in) STWS1 ASW torpedo tubes with Mk 46 and Stingray torpedoes

Aircraft: one Westland Lynx HAS.Mk 2 ASW helicopter

Electronics: one Type 978 navigation radar, one Type 992Q air- and surface-search radar, two RTN10X fire-control radars, one CAAIS combat data system, one UAA-1 ESM system (only in some), two Corvus chaff launchers, one Type 162M hull sonar, and one Type 184M hull sonar

Complement: 177 normal and 192 maximum



Below: After refitting, HMS **Andromeda** *and the other four Batch 3 'Leanders' are the most powerful of the 'Leander' variants. The planned conversion of the other five Batch 3s has fallen victim to cuts in the defence budget.*

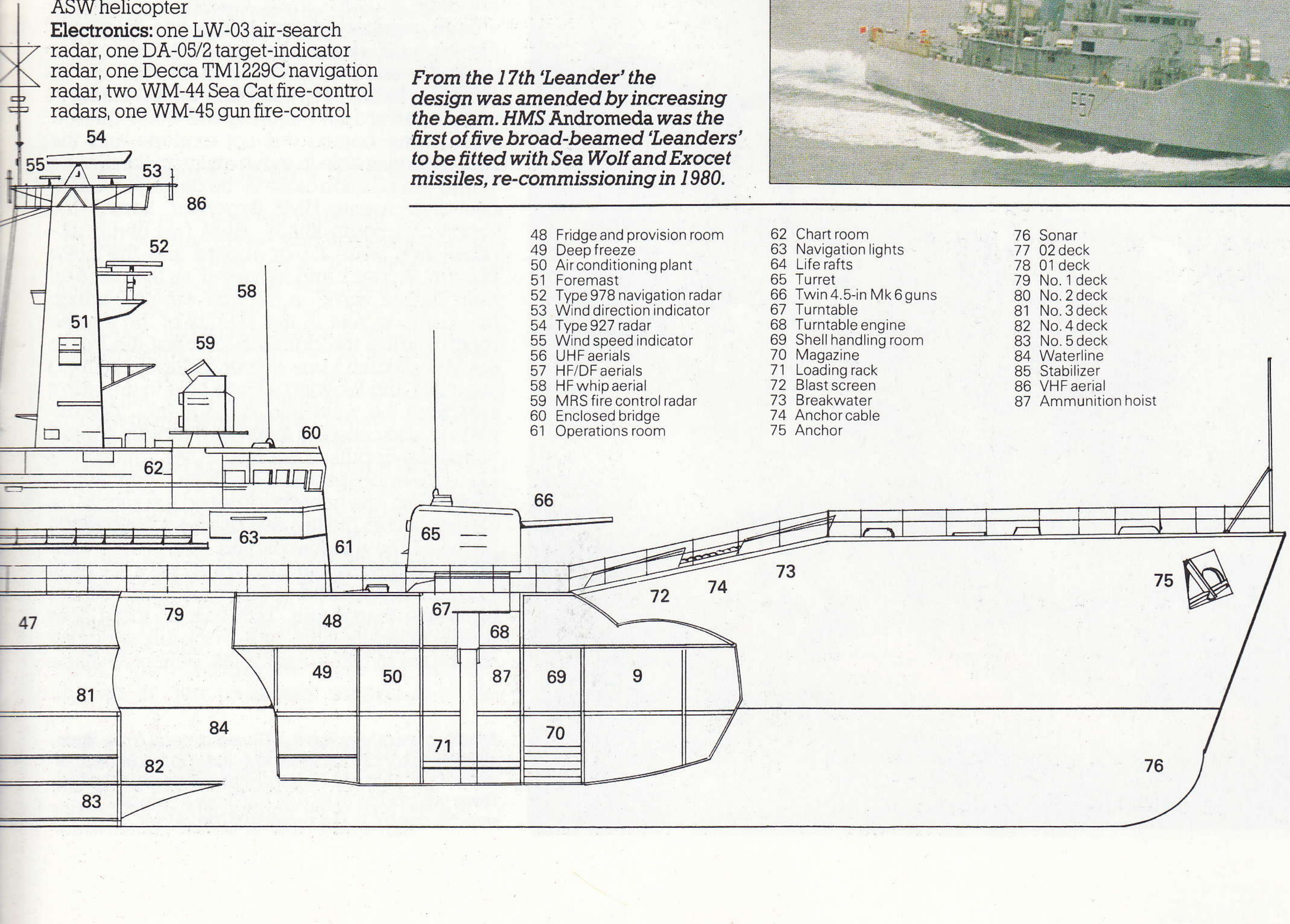
with eight missiles, two quadruple Sea Cat surface-to-air missile launchers with 32 missiles, one 76-mm (3-in) DP gun, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes

Aircraft: one Westland SH-14B/C Lynx ASW helicopter

Electronics: one LW-03 air-search radar, one DA-05/2 target-indicator radar, one Decca TM1229C navigation radar, two WM-44 Sea Cat fire-control radars, one WM-45 gun fire-control radar, one SEWACO II data information system, one passive ESM system, two Corvus chaff launchers, one CWE610 hull sonar, and one SQR-18A towed-array sonar

Complement: 180

From the 17th 'Leander' the design was amended by increasing the beam. HMS **Andromeda** *was the first of five broad-beamed 'Leanders' to be fitted with Sea Wolf and Exocet missiles, re-commissioning in 1980.*



48	Fridge and provision room
49	Deep freeze
50	Air conditioning plant
51	Foremast
52	Type 978 navigation radar
53	Wind direction indicator
54	Type 927 radar
55	Wind speed indicator
56	UHF aerials
57	HF/DF aerials
58	HF whip aerial
59	MRS fire control radar
60	Enclosed bridge
61	Operations room
62	Chart room
63	Navigation lights
64	Life rafts
65	Turret
66	Twin 4.5-in Mk 6 guns
67	Turntable
68	Turntable engine
69	Shell handling room
70	Magazine
71	Loading rack
72	Blast screen
73	Breakwater
74	Anchor cable
75	Anchor
76	Sonar
77	02 deck
78	01 deck
79	No. 1 deck
80	No. 2 deck
81	No. 3 deck
82	No. 4 deck
83	No. 5 deck
84	Waterline
85	Stabilizer
86	VHF aerial
87	Ammunition hoist

Type 21 in Action

The first privately designed warships to serve the Royal Navy in modern times, the 'Amazon' class saw considerable action during the 1982 South Atlantic campaign, with all but one of the class participating. Although two were lost, the ships fared well in the acid test of combat, testimony to both the soundness of their design and the ability of their crews.

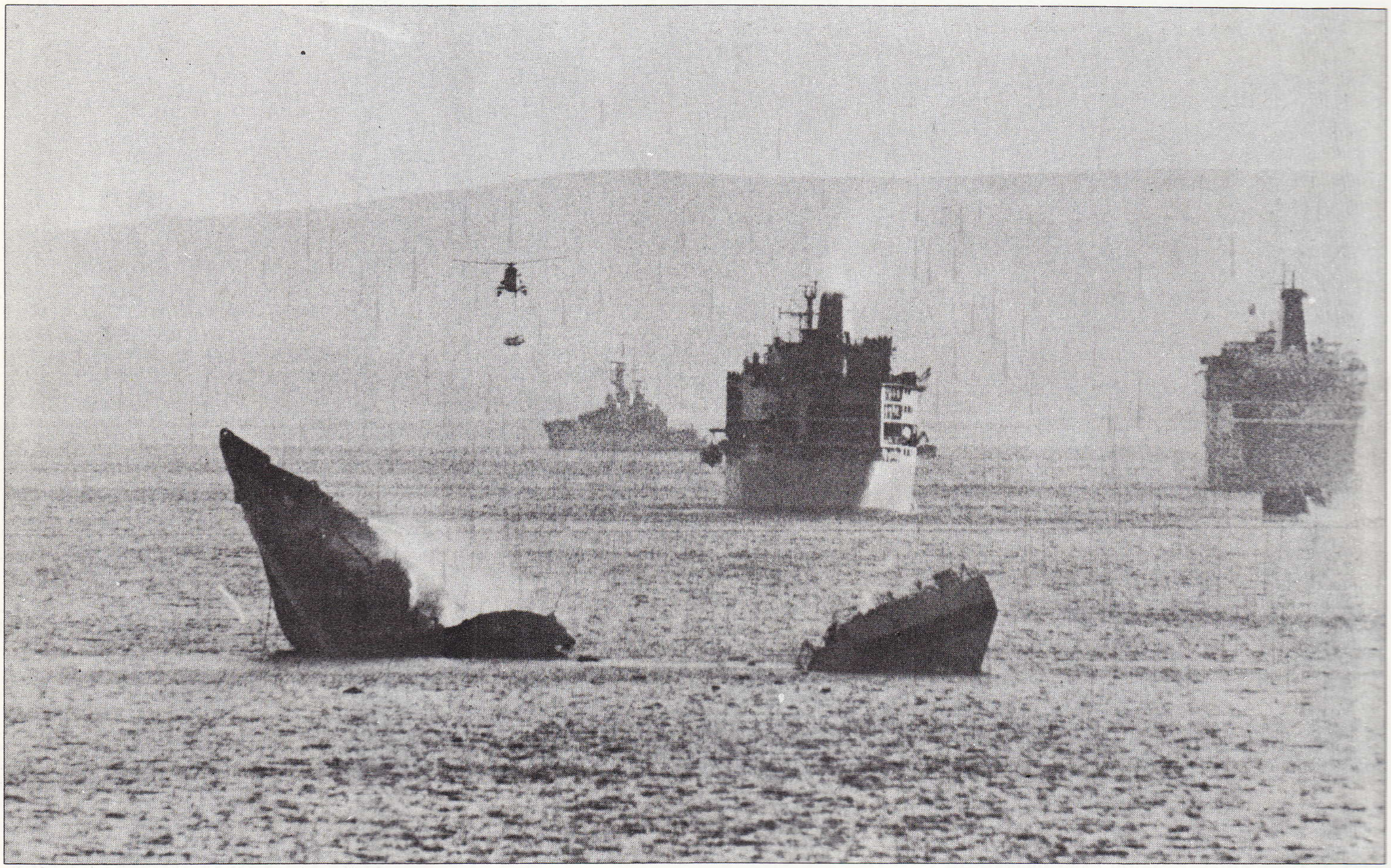
Since the first Type 21 frigate, HMS *Amazon*, commissioned in 1974 the class has proved very popular with its crews. The tasks with which they have been involved have included the peacetime missions of training, 'showing the flag' abroad, shadowing Soviet warships and undertaking security patrols in such places as the Persian Gulf to protect British shipping from 'accidental' attack by Iran and Iraq during the current Gulf War. However, the class's first claim to fame actually occurred in 1977 when the *Amazon* on a deployment to the Far East suffered a bad internal fire which, coupled with the earlier collision of the US missile cruiser USS *Belknap* with the carrier USS *John F. Kennedy* in the Mediterranean in 1975, highlighted the risk of building modern warships with aluminium superstructures to save top-weight. But it was not until the 1982 Falklands war that the Type 21s finally managed to prove their worth. HMS *Antelope*, HMS *Alacrity* and HMS *Arrow* sailed in the early part of April as part of the Task Force's escort and to convoy high-value surface ships such as the troopship *Canberra*. Once the Total Exclusion Zone had been entered and the Falkland Islands closed a surface bombardment group, comprising the destroyer HMS *Glamorgan* with the *Arrow* and the *Alacrity*, was ordered to bombard Argentine positions around Port Stanley on the afternoon of 1 May, following the Avro Vulcan and BAe Sea Harrier air strikes of the morning. During the withdrawal the *Arrow*, which had just become the first ship to fire at the islands, also became the first Royal Navy vessel to suffer damage in the conflict when the group was attacked by a number of IAI Daggers using bombs and cannon fire: a number of 30-mm rounds hit her superstructure, injuring one young rating. Things then grew quiet until 4 May when the destroyer HMS *Sheffield* was hit by an air-launched AM.39 Exocet missile. In a brilliant display of seamanship the captain of the *Arrow*, Commander P.J. Bootherstone, brought his vessel alongside the burning destroyer to initially help fight the fires raging uncontrollably below decks and then, when it had been realized that all was lost, to take off the survivors. During the rescue operation that accounted for 236 members of a total ship's company of around 300, HMS *Yarmouth* fired her Limbo ASW mortar at a suspected submarine contact and reported seeing a torpedo track near to the stationary vessels. This attack has not been specifically claimed by the Argentines, who will only admit that their submarine *San Luis* made three torpedo attacks against Task Force ships during the war, two against surface ships and one against a possible submarine.

The *Arrow* then went on eventually to join the San Carlos gun line after the initial British landings and to provide the vital naval gunfire support to the 2nd Parachute battalion's epic battle at Goose Green. The *Alacrity* in the meantime was employed in operations to prepare for the main 21 May assault at San Carlos. She landed the Special Boat Squadron reconnaissance team responsible for looking at potential landing beaches and on the night of 10 May sailed all the way through Falkland Sound between the two main islands on a mission designed both to harass the enemy and to locate shore defences or minefields that might endanger the operation. During the sweep she discovered an unidentified ship which failed to answer challenges. This vessel was then engaged with the *Alacrity*'s single 114-mm (4.5-in) gun on rapid fire. The scoring of several hits resulted in the ship exploding in a sheet of flame and rapidly sinking. Subsequently it was found that she had been the Argentine naval transport *Islas de Los Estados* of 3,840 tons carrying a cargo of aviation fuel and other supplies for the garrison. It was also *Alacrity*'s unfortunate duty to be one of the ships escorting the *Atlantic Conveyor* on 25 May when she was hit by two air-launched AM.39 Exocets after the *Ambuscade* had detected the incoming raid on her Type 992Q radar. Like *Arrow* previously, the *Alacrity* moved alongside to fight the fires and then rescue survivors as the crew abandoned ship.

Antelope hit

The third ship of the original three Type 21s that went to the Falklands was the *Antelope*, and she was not so lucky. Escorting the amphibious force into San Carlos Water on D-Day she survived the numerous air attacks of that day only to be singled out by a series of McDonnell Douglas A-4 Skyhawk strikes on 23 May when she was positioned in an air-defence slot at the entrance to San Carlos Water. The last two attacks resulted in two bomb hits by single 454-kg (1,000-lb) bombs, the first aft above her engine room and the second forward in the vicinity of the petty officers' mess, killing a young steward and injuring two other ratings. Luckily the bombs did not explode and the *Antelope* was able to move away up San Carlos Water to a position close to the damaged 'Leander' class frigate HMS *Argonaut*, herself the victim of a bomb attack. Here two bomb disposal men were flown aboard and the crew brought on deck and moved aft as the disposal men started work on the first weapon, which had come to rest in the vicinity of the engine room. During the defusing process the bomb exploded, killing one officer instantly, injuring the other and blowing a huge hole in the ship's side from the waterline to the funnel. The explosion also caused a fire which rapidly spread within the depths of the ship. After fighting the blaze for approximately one hour Commander Nick Tobin, the captain, ordered the ship to be abandoned as the fire was raging out of control. Just after the evacuation had been completed to the various craft around *Antelope* a series of explosions occurred as the flames reached the ordnance magazines. This caused more fires which gutted the ship, and on the following day she broke in two to form a last defiant V shape

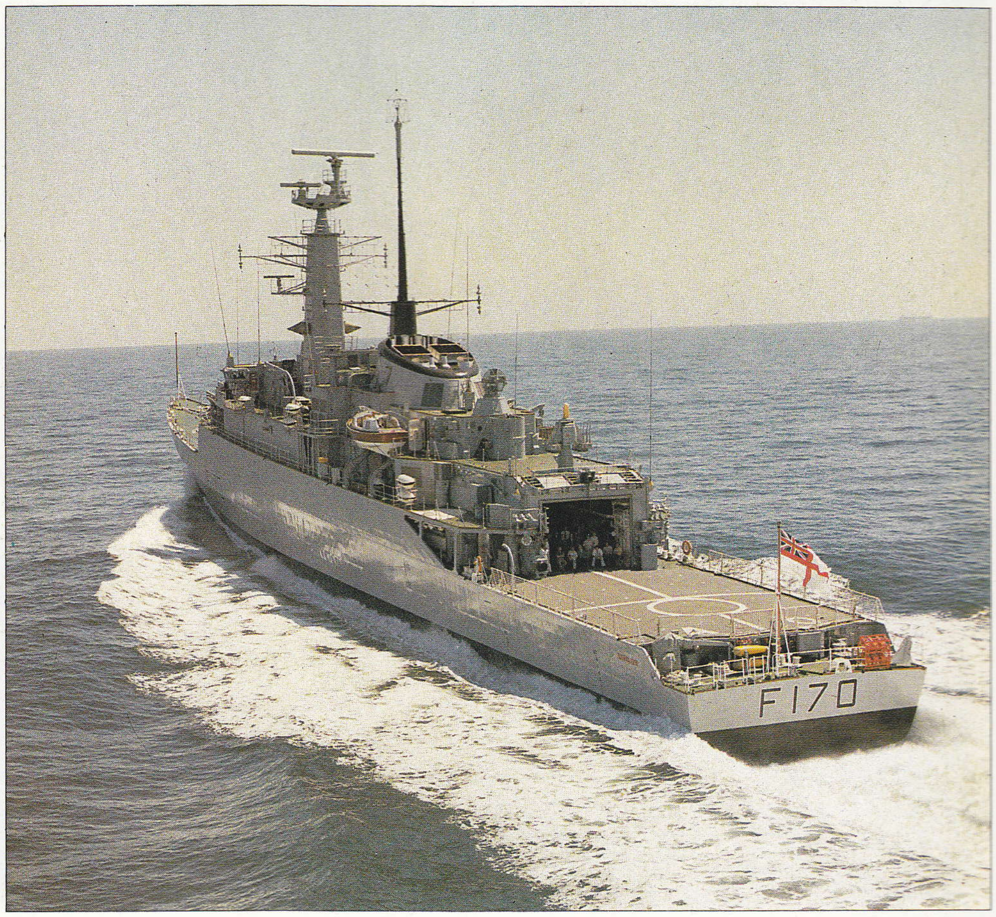
Modern warships have differed greatly from their predecessors since the wide-scale introduction of electronic sensors. Ships are no longer controlled from the bridge in battle, but from a combat control centre in the bowels of the vessel.



***Above:* The tragic remains of HMS *Antelope* lie in San Carlos Water. Hit twice by conventional bombs, she limped to shelter while efforts were made to defuse the unexploded weapons. These attempts were unsuccessful and the bombs exploded, causing fires which eventually reached the ship's magazine.**

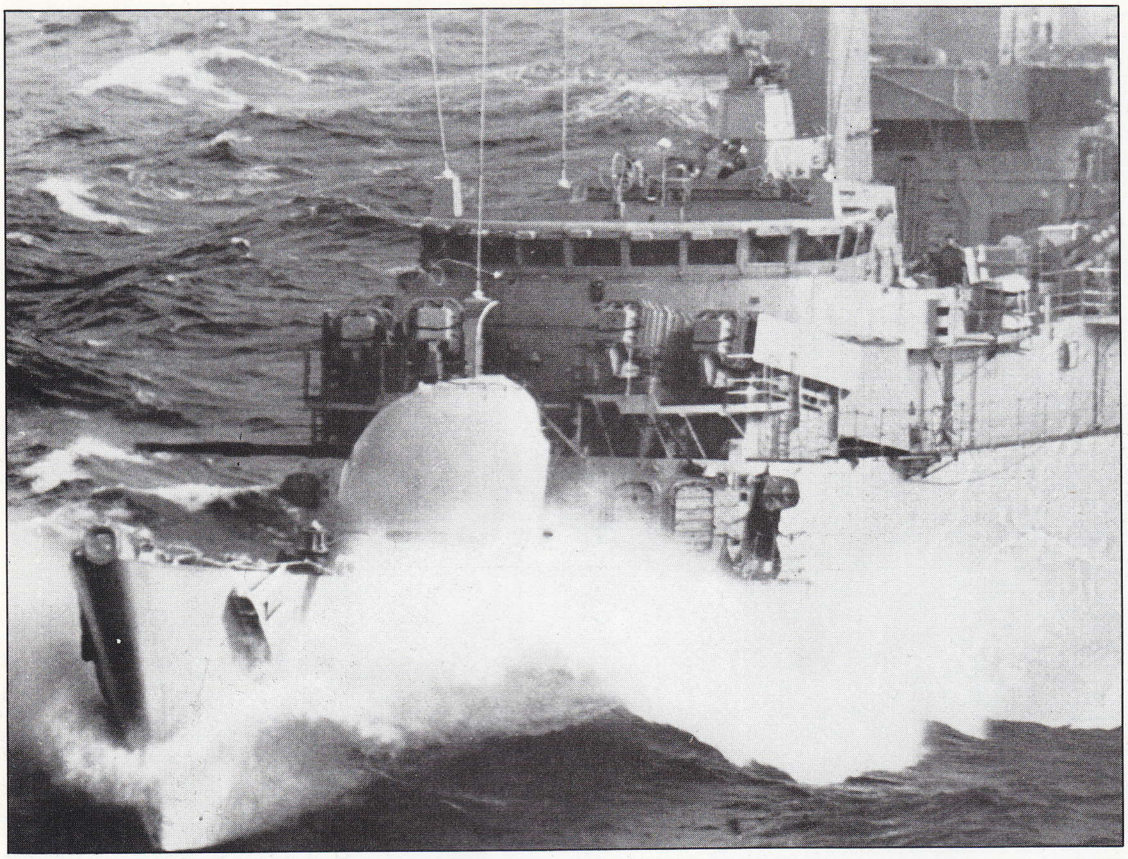
before the pieces finally slipped beneath the sea.

Two days before the *Antelope* was hit, the *Ardent* became the second British naval vessel to be sunk by Argentine action. On 21 May she took up an air-defence station after bombarding the area of Goose Green. Attacked by Skyhawks late in the afternoon, she was hit near the stern by 227-kg (500-lb) bombs: these disabled the Sea Cat SAM system and caused a fire which had just been contained by the damage control teams when more Skyhawks attacked. These hit her with two more bombs that exploded on the side aft, killing some 22 men and wounding more than 30 others. They also caused a fire which rapidly spread to the whole of the ship's after end. The damage sustained in the attacks was found to be too much for the repair parties and the order to anchor and abandon ship was given by the captain, Commander Alan West. Most of the *Ardent*'s survivors were taken off the forecastle by the *Yarmouth*, the rest being helicopter-winched from the sea in their 'once-only' survival suits. The

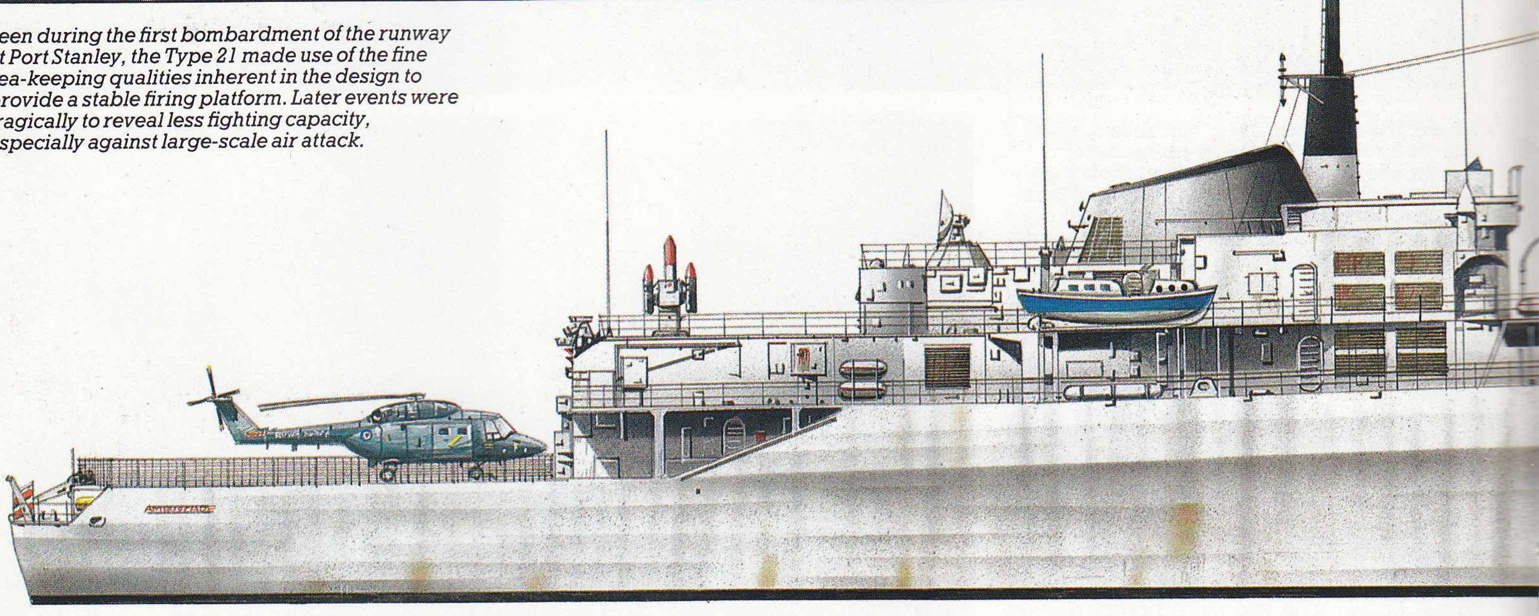


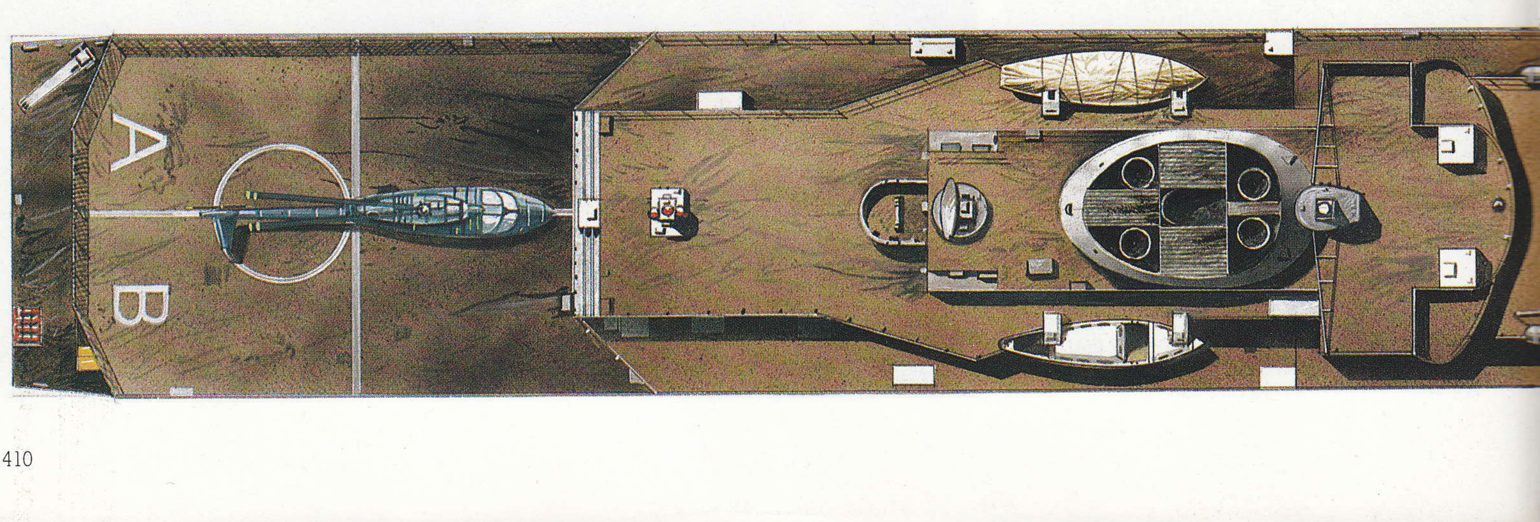
HMS* Antelope *(F170) is seen in happier days. The Type 21 frigates are splendid sea boats, handling extremely well. Unfortunately, they lack the capacity to handle the most up-to-date weapon systems, and have little growth potential.

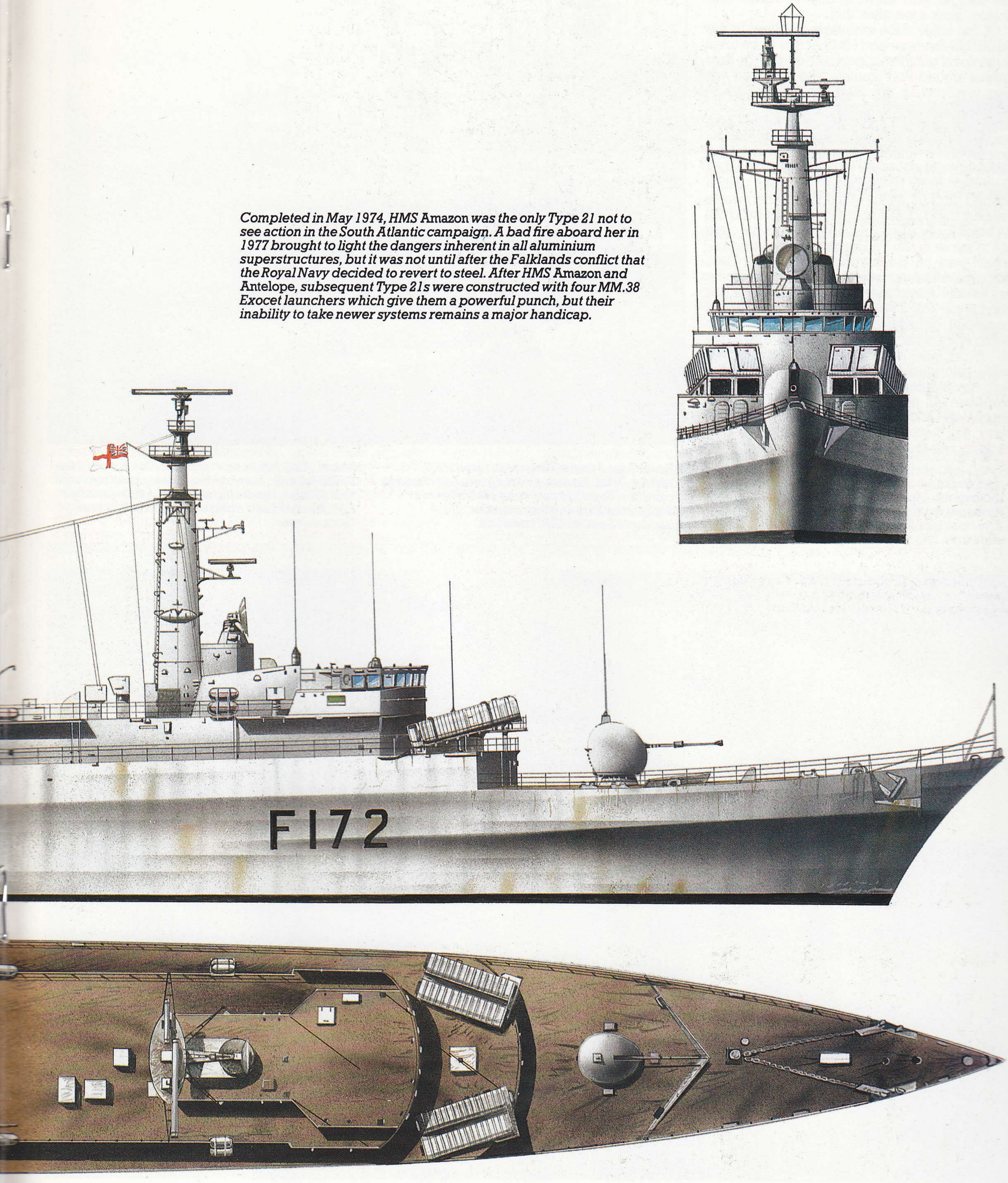
Type 21 in Action



Seen during the first bombardment of the runway at Port Stanley, the Type 21 made use of the fine sea-keeping qualities inherent in the design to provide a stable firing platform. Later events were tragically to reveal less fighting capacity, especially against large-scale air attack.







Completed in May 1974, HMS Amazon was the only Type 21 not to see action in the South Atlantic campaign. A bad fire aboard her in 1977 brought to light the dangers inherent in all aluminium superstructures, but it was not until after the Falklands conflict that the Royal Navy decided to revert to steel. After HMS Amazon and Antelope, subsequent Type 21s were constructed with four MM.38 Exocet launchers which give them a powerful punch, but their inability to take newer systems remains a major handicap.

derelict hulk, heeling slightly to starboard with the hangar and stern totally wrecked and ablaze, sank soon after this.

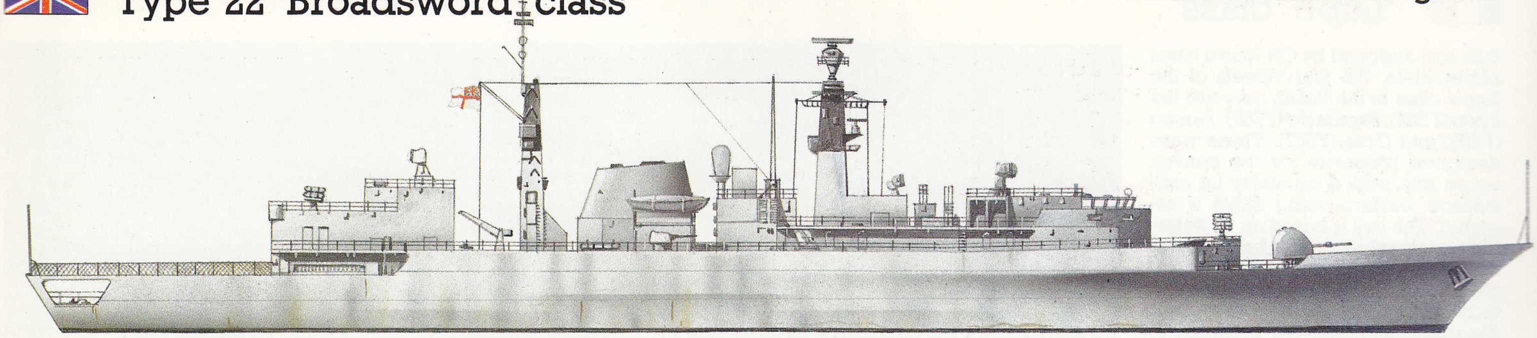
Of the other class members involved in the war, HMS *Avenger* and HMS *Active* were used in the naval gunfire support role during the final battles around Port Stanley. The *Avenger* was also involved in the 30 May AM.39 Exocet attack on the carrier force. During the attack she claimed one Skyhawk downed by fire from her 114-mm (4.5-in) gun and an Exocet missile destroyed by another shot from the weapon. However, the Skyhawk was credited to a Sea Dart shot from HMS *Exeter* together with a second aircraft, whilst of the fate of the missile the only thing known for certain is that it did not hit a task force ship. The only vessel of the class not to serve in the Falklands was the *Amazon*, which was on deployment in the Far East. Although suffering two losses and the discovery of hull fracturing as a result of local sea conditions, the Type 21s proved themselves excellent general-purpose frigates despite being somewhat underarmed, and they have all undergone a strengthening programme since returning home. Their future since the war has been slightly cloudy, however, as rumours of premature retirement have abounded; if these are true, then the Royal Navy will have lost yet more badly needed frigates, not this time to enemy action.

Above: Seen here leading the ill-fated HMS Antelope, *HMS* Amazon *steams gracefully through a calm sea. Type 21s carry four MM.38 Exocet missile launchers and four missiles, plus a quadruple Sea Cat SAM launcher.*

Below: HMS Arrow *saw considerable action in the South Atlantic, bombarding enemy positions near Port Stanley, rendering assistance to the stricken HMS* Sheffield *and firing in support of 2 Para at Goose Green.*

UK

Type 22 'Broadsword' class



Batch 3 variants of the 'Broadsword' class will be highly capable ships, although the frigate description may seem odd for a vessel nearing 5000 tonnes and with significant air, surface and anti-submarine capabilities.

Originally to have been a class of 26 to follow the 'Leanders' the **Type 22** or **'Broadsword' class** design was conceived as an ASW ship for use in the Greenland-Iceland-UK gap against modern high-performance nuclear submarines. However, as has happened to most modern British naval programmes, the 'chop' fell during defence cuts and the procurement schedule has been changed somewhat. The original four **'Broadsword Batch 1'** vessels ordered were HMS ***Broadsword*** (F88), HMS ***Battleaxe*** (F89), HMS ***Brilliant*** (F90) and HMS ***Brazen*** (F91). Although rated as frigates, these are in fact larger than the contemporary Type 42 destroyers, and were designated frigates for purely political reasons. The hull, with greater freeboard than that of the destroyers is an improved Type 12 design for use in rough weather without a significant reduction in speed.

Unfortunately, because of design shortcomings they cannot be fitted with the definitive Type 2031(Z) towed-array sonar at the stern, so a lengthened **'Broadsword Batch 2'** version had to be authorized. The six Batch 2s subsequently ordered to rectify the problem were HMS ***Boxer*** (F92), HMS ***Beaver*** (F93). HMS ***Brave*** (F94), HMS ***London*** (F95), HMS ***Sheffield*** (F96) and HMS ***Coventry*** (F97), and these will also differ amongst themselves as from the *Brave* onwards the propulsion plant will be two Rolls-Royce Spey SM1A and two Rolls-Royce Tyne RM1A gas turbines in a COGAG arrangement. The *Brave* will also be the first Type 22 unit to have an enlarged flight deck to take a Sea King or EH101 ASW helicopter.

Following the 1982 Falklands war a **'Broadsword Batch 3'** variant has been ordered: the four units will be HMS ***Cornwall*** and three as-yet unnamed vessels, these having the same basic hull as the Batch 2s but with eight Harpoon SSMs, a single 114-mm (4.5-in) DP gun and two CIWS. All three batches will eventually have the new Type 2050 fleet sonar to replace the Type 2016.

During the Falklands war the *Brilliant* and *Broadsword* distinguished themselves in combat, the former being the first vessel to fire the Sea Wolf SAM in anger.

Specification

'Broadsword Batch 1' class

Displacement: 3,500 tons standard and 4,400 tons full load

Dimensions: length 131.1 m (430.0 ft); beam 14.8 m (48.5 ft); draught 6.1 m (19.9 ft)

Propulsion: COGOG arrangement with two Rolls-Royce Olympus TM3B gas turbines delivering 50,000 hp (37285 kW) and two Rolls-Royce Tyne RM1A gas turbines delivering 8,500 hp (6338 kW) to two shafts

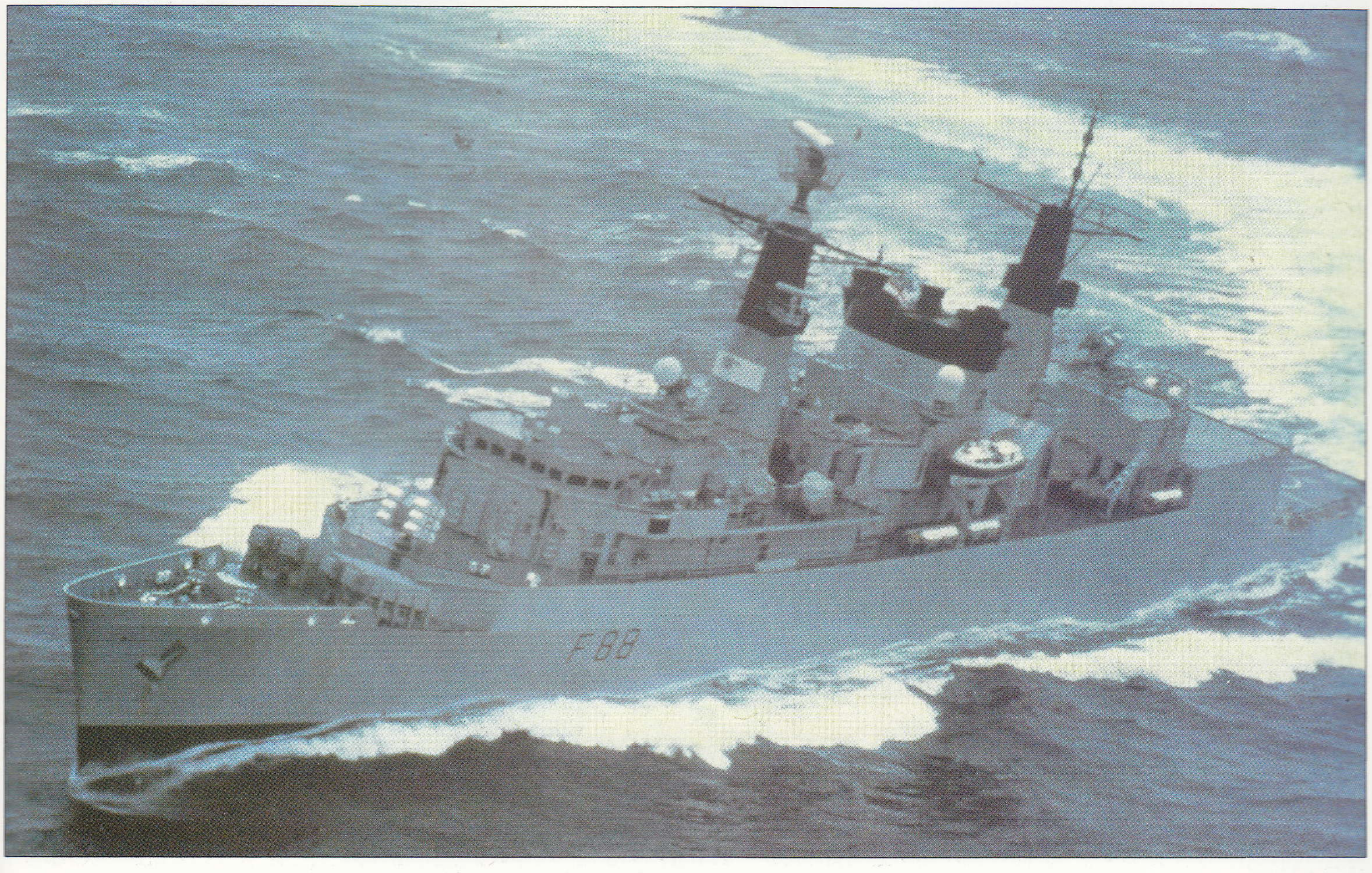
Speed: 29 kts

Armament: four single MM.38 Exocet surface-to-surface missile launchers with four missiles, two sextuple GWS25 Sea Wolf surface-to-air missile launchers with 60 missiles, two single 40-mm AA guns, two single 20-mm AA guns, and (F90 and F91) two triple 324-mm (12.75-in) STWS1 ASW torpedo tubes with Mk 46 and Stingray torpedoes

Aircraft: one or two Westland Lynx HAS.Mk 2/3 ASW/anti-ship helicopters

Electronics: one Type 967/968 air- and surface-search radar, two Type 910 Sea Wolf fire-control radars, one Type 1006 navigation radar, one CAAIS combat data system, one UAA-1 ESM system, two Corvus chaff launchers, two Mk 36 Super RBOC chaff launchers, one Type 2016 hull sonar, and one Type 2008 underwater telephone

Complement: 223 normal and 248 maximum



A high-speed turn is made by HMS* Broadsword *(F88), first of the Type 22 class. These vessels, with their twin Lynx helicopters, were designed to counter modern high-performance nuclear submarines, and to do so in the harsh seas north and west of the British Isles.

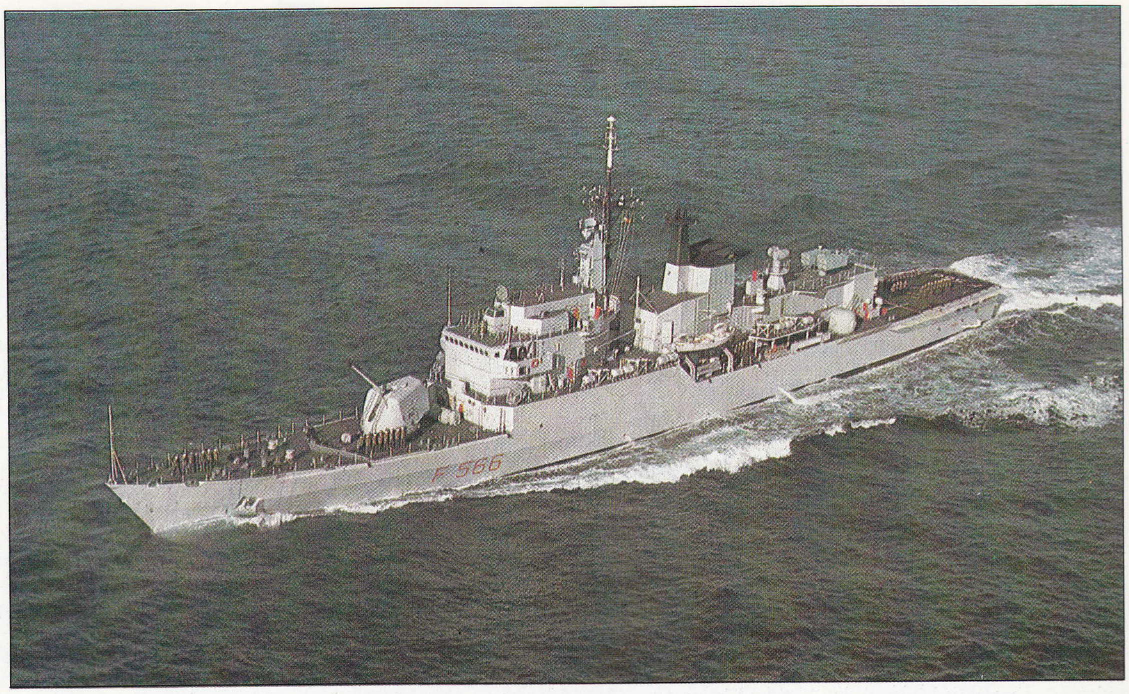
ITALY

'Lupo' class

Built and designed by CN Riuniti naval shipbuilders, the four vessels of the **'Lupo' class** in the Italian navy are the ***Lupo*** (F564), ***Sagittario*** (F565), ***Perseo*** (F566) and ***Orsa*** (F567). These were designed primarily for the convoy escort role, with a capability for anti-surface warfare using SSMs if required. The hull is based on 14 watertight compartments and has fixed-fin stabilizers. To reduce the ship's complement the machinery plant has been highly automated and divided into four separate compartments housing the auxiliaries, gas turbine modules, reduction gearbox and the diesel alternator sets. A telescopic hangar has also been fitted to accommodate a light ASW helicopter that can also double in the missile-armed surface strike role.

The 'Lupos' have proved very popular in Italian navy service, and the type has been exported to Venezuela, Peru and Iraq in a modified form that has a fixed-hangar structure and no reloads for the SAM launcher. The six Venezuelan ships are the ***Mariscal Sucre*** (F21), ***Almirante Brion*** (F22), ***General Urdaneta*** (F23), ***General Soublette*** (F24), ***General Salom*** (F25) and ***Almirante José de Garcia*** (F26). The four Peruvian ships are the ***Meliton Carvajal*** (F51), ***Manuel Villavicienco*** (F52), ***Montero*** (F53) and an as yet unnamed unit. The four Iraqi units are the *Hittin*, *Thi Qar*, *Al Yarmook* and *Al Qadisyaa*, which are in various stages of construction with the first to be delivered next year.

The main anti-ship weapon carried on the Italian ships is the Otomat Mk 2 Teseo missile, which has an Italian SMA active radar-homing seeker and a sea-skimming flight profile. To utilize the missile's over-the-horizon capabilities fully, the embarked helicopter is used for mid-course guidance. Export ships carry the less capable Otomat Mk 1 missile that has a pop-up terminal attack manoeuvre.



***Perseo**, the third 'Lupo' class frigate to enter service with the Italian navy, is seen with her forward OTO-Melara 76-mm gun at high elevation. A total of 18 have been or are being built for the Italian, Peruvian, Venezuelan and Iraqi navies.*

Specification

'Lupo' class (Italian navy)

Displacement: 2,208 tons standard and 2,525 tons full load

Dimensions: length 113.2 m (371.3 ft); beam 11.3 m (37.1 ft); draught 3.7 m (12.1 ft)

Propulsion: CODOG arrangement with two General Electric/FIAT LM2500 gas turbines delivering 51,600 hp (38478 kW) and two GMT A230 diesels delivering 7,900 hp (5891 kW) to two shafts

Speed: 35 kts

Armament: eight single Otomat Mk 2 surface-to-surface missile launchers with eight missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with 24 Aspide missiles, one 127-mm (5-in) DP gun, two twin 40-mm Dardo CIWS, and two triple Mk 32 324-mm (12.75-in) ASW torpedo tubes with Mk 46 torpedoes

Aircraft: one Agusta-Bell AB.212ASW helicopter

Electronics: one RAN10S air- and surface-search radar, one SPQ2F surface-search radar, one RAN11/LX air- and surface-search radar, one RTN10X fire-control radar, two RTN20X Dardo fire-control radars, one SPN703 navigation radar, one IPN10 command and control system, active and passive ESM systems, two SCLAR chaff launchers, and one DE1160B hull sonar

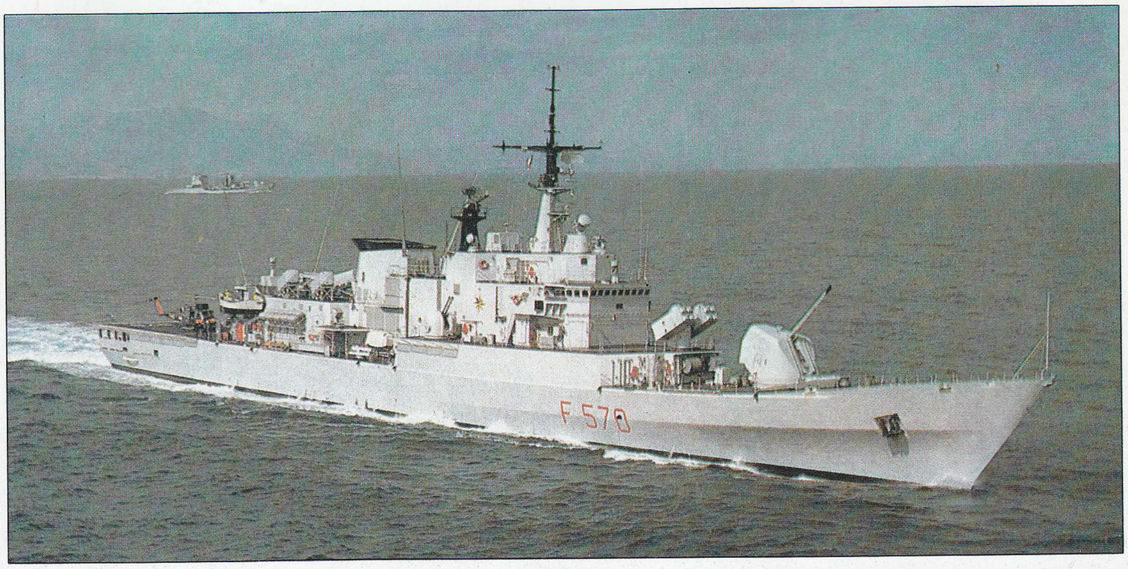
Complement: 186

ITALY

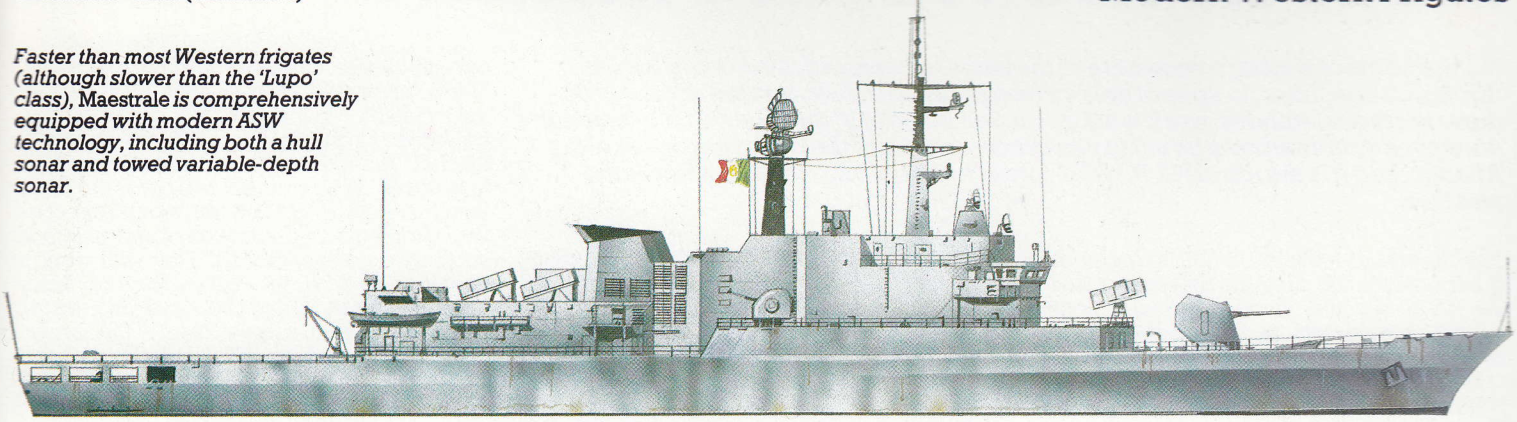
'Maestrale' class

The **'Maestrale' class** is essentially a stretched version of the 'Lupo' design with less weapons and a greater emphasis on ASW. The increase in length and beam over the earlier 'Lupos' was to provide for a fixed hangar installation and a variable-depth sonar (VDS) housing at the stern. The improvements have resulted in better seaworthiness and habitability, plus the room required to carry and operate a second light helicopter. However, to compensate for this the class carries four less SSMs, and because of the extra tonnage has suffered a speed reduction of around 3 kts. The Raytheon VDS operates on the same frequencies as the hull sonar set and gives the vessels a valuable below-the-thermal-layer capability for use in the very difficult ASW conditions met in the Mediterranean. To enhance the ships' ASW operations further, the Agusta-Bell AB.212 helicopters carried are fitted with Bendix ASQ-13B active dunking sonars. The armament they carry is either the American Mk 46 homing torpedo or Mk 54 depth charge. The ship uses the A244/S torpedo as well. It is also fitted with two fixed tubes for the 36-kt 25-km (15.5-mile) range Whitehead Motofides A184 533-mm (21-in) wire-guided torpedo beneath the helicopter pad aft. The A184 can be used against surface and sub-surface targets. A towed-array system that can use the existing VDS installation is currently under development. The helicopters can also carry AS.12 wire-guided anti-ship missiles and will eventually be converted to the Marte ASM system.

The eight ships are the ***Maestrale*** (F570), ***Grecale*** (F571), ***Libeccio*** (F572), ***Scirocco*** (F573), ***Aliseo*** (F574), ***Euro*** (F575), ***Espero*** (F576) and ***Zeffiro*** (F575), and all are now in service with the Italian navy.



*Comparable to the Dutch 'Kortenaer' or German 'Bremen' classes, the 'Maestrale' class is somewhat faster. Largely a stretched version of the preceding 'Lupo' class, **Maestrale** and her seven sisterships possess enhanced ASW abilities.*



Faster than most Western frigates (although slower than the 'Lupo' class), Maestrale is comprehensively equipped with modern ASW technology, including both a hull sonar and towed variable-depth sonar.

Specification
'Maestrale' class

Displacement: 3,040 tons standard and 3,200 tons full load

Dimensions: length 122.7 m (402.6 ft); beam 12.9 m (42.3 ft); draught 8.4 m (27.6 ft)

Propulsion: CODOG arrangement with two General Electric/FIAT LM2500 gas turbines delivering 51,600 hp (38478 kW) and two GMT B230 diesels delivering 10,146 hp (7566 kW) to two shafts

Speed: 32 kts

Armament: four single Otomat Mk 2 surface-to-surface missile launchers with four missiles, one octuple Albatros surface-to-air missile system with 24 Aspide missiles, one 127-mm (5-in) DP gun, two twin 40-mm Dardo CIWS, two single 533-mm (21-in) torpedo tubes for A184 torpedoes, and two triple 324-mm (12.75-in) ILAS-3 ASW torpedo tubes for Mk 46 and A244/S torpedoes

Aircraft: two Agusta-Bell AB.212 ASW helicopters

Electronics: one RAN10S air- and surface-search radar, one SPQ2F surface-search radar, one RTN30X Albatros acquisition radar, two RTN20X Dardo fire-control radars, one RTN10X fire-control radar, one SPN703 navigation radar, one IPN10 command and control system, active and passive ESM systems, two SCLAR D chaff launchers, one DE1160B hull sonar, and one DE1164 variable-depth sonar

Complement: 213

USA

'Garcia' and 'Brooke' classes

Designed in the late 1950s as replacements for World War II destroyers, the **'Garcia' class** ASW escort and **'Brooke' class** SAM ship were ordered by the US Navy to the extent of 10 and six units respectively. Further production of the latter ended during Fiscal Year 1963 because of their high cost and limited capability. Although they are relatively modern, there are no plans to modernize the ASW ships USS ***Garcia*** (FF1040), USS ***Bradley*** (FF1041), USS ***Edward McDonnell*** (FF1043), USS ***Brumby*** (FF1044), USS ***Davidson*** (FF1045), USS ***Voge*** (FF1047), USS ***Sample*** (FF1048), USS ***Koelsch*** (FF1049), USS ***Albert David*** (FF1050) and USS ***O'Callahan*** (FF1051) with new guns, Harpoon SSM and modern ESM equipment. Over the years the class has been used to test a number of prototype systems including the SQR-15 linear towed-array sonar which is now fitted to FF1040 and FF1043 in place of a LAMPS I ASW helicopter. An automated ASW tactical data system (TDS) is carried by FF1047 and FF1049, whilst from FF1047 onwards an ASROC reload magazine has been fitted within the superstructure.

The SAM ships USS ***Brooke*** (FFG1), USS ***Ramsey*** (FFG2), USS ***Schofield*** (FFG3), USS ***Talbot*** (FFG4), USS ***Richard L. Page*** (FFG5) and USS ***Julius F. Furer*** (FFG6) are identical to the 'Garcias' except that a single-rail Mk 22 launcher, originally for Tartar and now for Standard SM-1MR missiles, replaces the aft 127-mm (5-in) gun mount. From FFG4 onwards an ASROC reload magazine was also incorporated into the superstructure. The *Talbot* was used as the test ship for the weapons and sensor fit for the 'Oliver Hazard Perry' class, but has now been returned to normal appearance. The only planned modernization of the ships is the fitting of the SLQ-32(V)2 ESM suite to replace older systems.

Specification
'Garcia' class

Displacement: 2,620 tons standard and 3,560 tons full load

Dimensions: length 126.3 m (414.5 ft); beam 13.5 m (44.2 ft); draught 4.4m (14.5 ft)

Propulsion; geared steam turbines delivering 35,000 hp (26100 kW) to two shafts

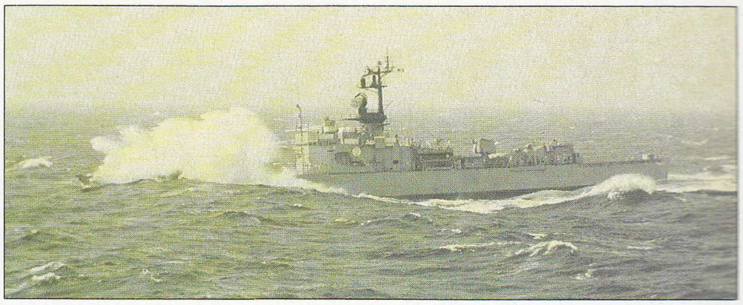
Speed: 27.5 kts

Armament: two single 127-mm (5-in) DP guns, one octuple ASROC anti-submarine missile launcher with eight (first five ships) or 16 (other ships) missiles, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes

Aircraft: one Kaman SH-2F Seasprite LAMPS I helicopter (not in FF1040 and FF1043)

Electronics: one SPS-40 air-search radar, one SPS-10 surface-search radar, one SPG-35 fire-control radar, one LN66 navigation radar, one WLR-1 ECM system, one WLR-3 ECM system, one ULQ-6 ECM system, one SRN-15 TACAN (not in FF1040 and FF1043), one SQS-26 bow sonar, and (FF1040 and FF1043 only) one BQR-15 towed sonar

Complement: 247 except FF1040, FF1041, FF1043 and FF1044 239



USS Edward McDonnell (FF1043) of the 'Garcia' class plunges through a heavy sea. Unlike later US frigate classes, the 'Garcias' are ASW-dedicated, and have little or no modern anti-aircraft capability.

Specification
'Brooke' class

Displacement: 2,643 tons standard and 3,426 tons full load

Dimensions: length 126.3 m (414.5 ft); beam 13.5 m (44.2 ft); draught 4.6 m (15.0 ft)

Propulsion: as 'Garcia' class

Speed: 27.2 kts

Armament: one single-rail Mk 22 Standard surface-to-air missile launcher with 16 SM-1MR missiles, one 127-mm (5-in) DP gun, one octuple ASROC anti-submarine missile launcher with eight (first three ships) or 16 (other ships) missiles, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes

Aircraft: one Kaman SH-2F Seasprite LAMPS I helicopter

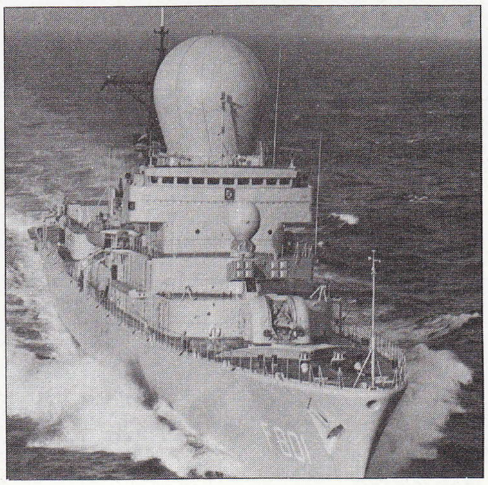
Electronics: one SPS-52B 3D radar, one SPS-10F surface-search radar, one LN66 navigation radar, one SPG-51C Standard fire-control radar, one SPG-35 gun fire-control radar, one SRN-15 TACAN, one SLQ-32(V)2 ESM system, two Mk 36 Super RBOC chaff launchers, and one SQS-26 bow sonar

Complement: 248

USS Brooke (FFG1) is name ship of a six-vessel class built to a modified 'Garcia' design. The difference lies in the fitting of a Mk 22 single-rail missile launcher in place of the aft 5-in (127-mm) gun. The standard SM-1MR missiles now carried give the class considerable anti-aircraft potential.

ASW in the North Atlantic

In the middle of winter, somewhere to the east of Greenland, a lone ship battles through the weather. In spite of gale-driven spray and sleet, and the short day in these northern latitudes, work must go on. Somewhere in the relative calm beneath the waves a submarine is trying to pass undetected into the broad expanses of the Atlantic, and it is the job of NATO ASW forces to detect and trail it, whatever the weather.



Apart from the US and British navies, only the Netherlands maintains regular ASW task groups in the North Atlantic. The two 'Tromp' class frigates act as flagships for the two ASW squadrons assigned to CinCEastLant in wartime.

The Greenland-Iceland-UK (GIUK) gap is vitally important to the strategic defensive plans of the NATO alliance. Through this alignment of natural 'choke points' the Soviets would have to pass large numbers of nuclear- and conventionally-powered cruise missile and attack submarines to reinforce the units already in the North Atlantic for the attempted interdiction of NATO's sea lines of communication (SLOCs). Although the United States has already set up a major programme of prepositioning land and air force equipment, stores, fuel and munitions in Europe, to be matched up with troops and aircraft flown in during an emergency (so reducing the dependence on resupply by sea during the initial combat phase), the projected heavy expenditure of supplies and weapons makes such resupply critical for the later stages of any attempt to stem a Warsaw Pact offensive.

Current US (and hence NATO) ASW strategy is to combine the point-defence of high-value surface targets and ship formations such as carrier battle groups, resupply convoys and underway replenishment groups with offensive searches by hunter-killer ASW groups and maritime patrol aircraft, and also the creation of 'barrier' defences by all available units (especially submarines) at natural 'choke points'. The GIUK gap is the first such natural obstacle that NATO can exploit to wear down the Soviet submarine force as it transits to and from its Kola peninsula bases to resupply with weapons, which even the nuclear submarine has to do during war. To perform the initial detection in the gap, NATO relies on a series of fixed sonar arrays in the area; these form part of the US Sound Surveillance System (SOSUS) for the North Atlantic. However, as the network is gradually destroyed during war (as it surely will be), then the defending ASW forces will switch to a mixture of mobile SOSUS towed arrays (known as SURTASS), the tactical towed arrays of escorts and submarines, and special air-dropped area-surveillance sonobuoys that have been designed for just such a role. Selective 'sanitization' operations by patrol aircraft and ASW surface ships groups will also be conducted in areas most likely to be frequented by Soviet submarines.

It is the latter, coupled with the increasing inability of the medium-range sonars and the poor capabilities of Royal Navy surface ships to detect modern nuclear submarines penetrating the gap, that resulted in the building of the Type 22 frigate with its Type 2016 fleet sonar. This design also introduced the higher degree of autonomy and seakeeping required by a surface vessel to stay on station during all the weather conditions encountered in the gap. The Type 22's fully automatic Sea Wolf SAM systems also offer the possibility of defence against the deadly 'pop-up' attack from Soviet submarine-launched SS-N-7 and SS-N-9 anti-ship cruise missiles. The US 'Spruance' class ASW destroyer was also built with the gap in mind and as the primary point-defence unit for carrier battle groups that have to pass through the region on the way to their strike positions in the Norwegian and Barents Seas. Surprisingly it is the Royal Navy which has built the ASW aircraft-carrier designed to fight in the gap. These 'Invincible' class vessels act as leaders for the hunter-killer groups that will operate behind and in front of the gap as direct screens for NATO's strike carrier forces against subsurface attack. Their primary weapon is the Westland Sea King HAS.Mk 5 helicopter equipped with dipping sonar, sonobuoys and magnetic anomaly detectors (MAD). They will work in conjunction with the Type 22s and Ikara-equipped 'Leanders' to hunt down and destroy individual Soviet submarines. If the conflict goes nuclear, then the B57 nuclear depth bomb will be used to ensure a 100 per cent kill probability; otherwise the primary weapon will be either the Mk 46 or Stingray homing torpedo. For submarines damaged and thus near the surface or for submarines running shallow, Limbo depth bombs and air-dropped HE depth charges will be used.

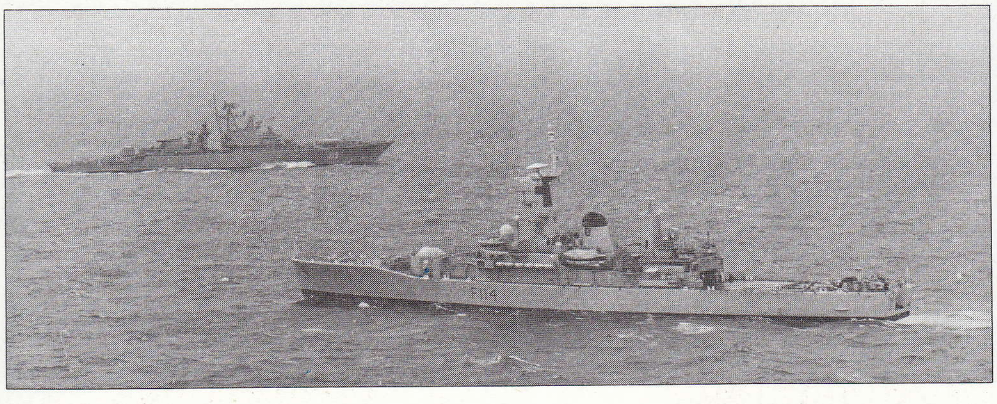
Nuclear capability

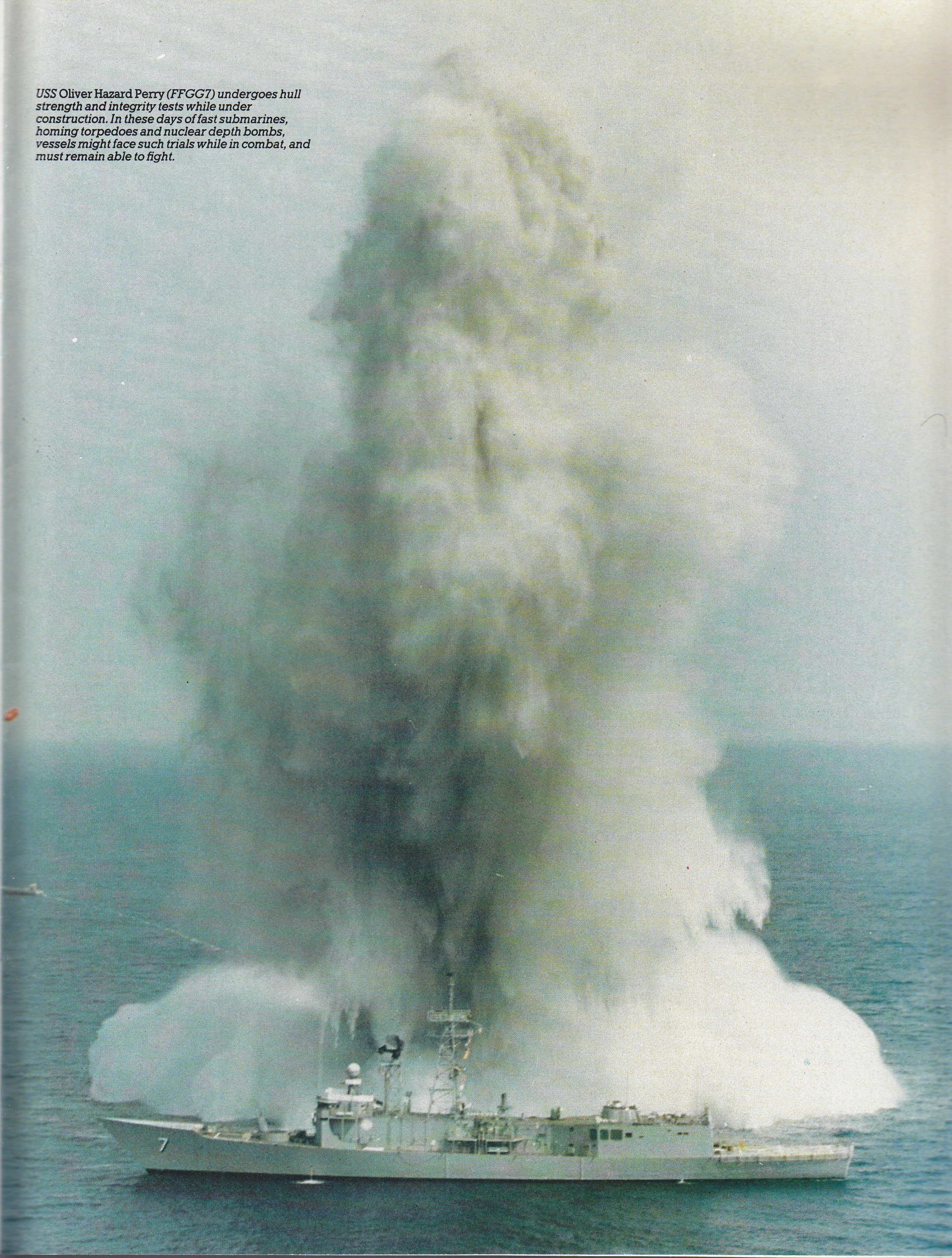
At present only the Dutch navy, Royal Navy and US Navy surface ships will be involved in operations around the gap, with overhead patrol aircraft cover provided by the US Navy and Dutch navy Lockheed P-3C Orions and Royal Air Force BAe Nimrod MR.Mk 2s. These aircraft will carry homing torpedoes as their major weapons payload, but can also drop the B57 nuclear depth bomb. The main detection system used by the aircraft is the active and passive sonobuoy laid in search patterns over considerable areas. Final detection is by MAD, but for night and bad-weather search for periscopes the aircraft carry low-light television and forward-looking infra-red devices.

When NATO submarines are used in 'barrier' operations across the gap, these will be predominantly nuclear-powered; however, in the shallower areas Dutch and British conventional boats will be used as they are better listening platforms. Each craft will be allocated a patrol zone from which other NATO submarines and surface ships will be banned to prevent 'home goals' from being scored. The boats will use their passive long-range sonar detection systems to search the surrounding water masses for any tell-tale noise emissions from an enemy submarine. Once such an opponent has been detected the NATO boat will close the potential target at high speed and manoeuvre into a position from which the target's course and speed can be determined. The target is then classified and if hostile will be engaged with wire-guided homing torpedoes. If the trailing boat is a US submarine it might opt to attack with a ballistic subsurface-to-subsurface nuclear-tipped SUBROC ASW missile, which is fired along the target's bearing to the target's predicted position. At this point the weapon is released into the water and sinks to a preprogrammed depth where the warhead detonates. The resultant 5-kiloton underwater nuclear blast crushes all submerged objects within several kilometres of the detonation point by the pressure wave it produces.

In the future much greater engagement ranges for both American and, it is hoped, British nuclear attack submarines will be provided as the ASW Stand-Off Weapon equipped with nuclear or homing torpedo payloads is introduced into service, thus opening up the prospect of engaging submarines at ranges of more than 161 km (100 miles) without the target being aware of it: an ideal situation for submarines on 'barrier' patrols in the gap.

Emerging from the Baltic, a Soviet 'Krivak' class frigate is shadowed by HMS Ajax, an 'Ikara' class ASW missile-armed frigate of the Royal Navy. An interesting contrast can be seen between the Soviet and British approaches to ASW vessel design.

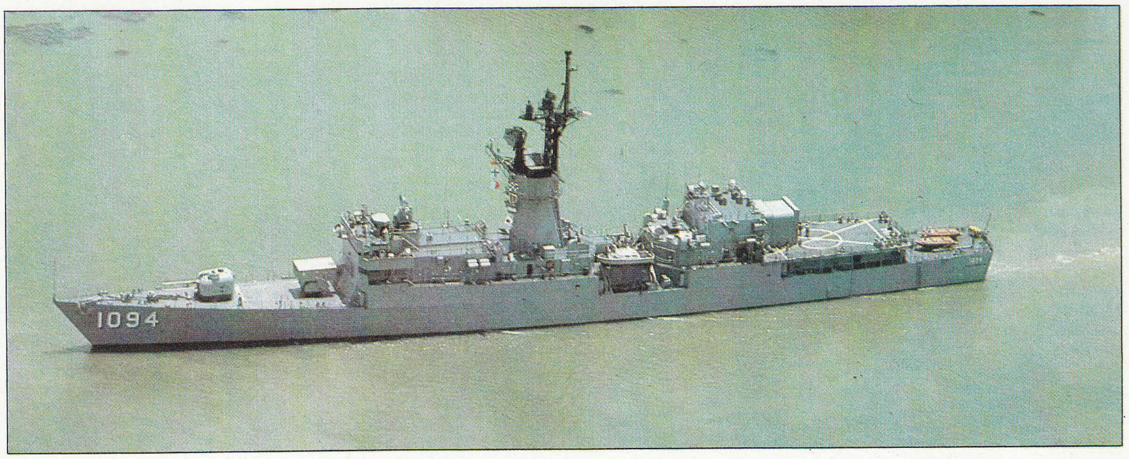




USS Oliver Hazard Perry *(FFGG7) undergoes hull strength and integrity tests while under construction. In these days of fast submarines, homing torpedoes and nuclear depth bombs, vessels might face such trials while in combat, and must remain able to fight.*

USA

'Knox' class



USS* Pharris *(FF1094) is seen during an exercise off the South American coast. The 46 'Knox' class vessels are dedicated to the ASW role and have recently undergone major refits to improve seakeeping.

The **'Knox' class** is similar to the 'Garcia' and 'Brooke' designs, but is slightly larger because of the use of non-pressure fired boilers, and was designed in the early 1960s. The first vessels entered US Navy service in 1969, the last units of the 46-strong class being delivered in 1974. They are specialized ASW ships and have been heavily criticized because of their single propeller and solitary 127-mm (5-in) gun armament.

A five-ship class based on the design but with a Mk 22 missile launcher for 13 Standard SM-1MR and three Harpoon missiles was constructed in Spain for the Spanish navy. Built with American aid, the ***Baleares*** (F71), ***Andalucia*** (F72), ***Cataluna*** (F73), ***Asturias*** (F74) and ***Extremadura*** (F75) also carry two Mk 25 ASW torpedo tubes as well as the two triple Mk 32 systems, for which a total of 22 Mk 44/46 and 19 Mk 37 ASW torpedoes are stored in each ship's magazines.

From 1980 onwards the American 'Knoxes' were taken in hand to receive raised bulwarks and spray stakes forward to improve their seakeeping in heavy weather. Like the 'Garcia' class, numerous 'Knoxes' have been used over the years to test individual prototype weapon and sensor systems. A total of 32 (FF1052-1083) were equipped with an octuple Sea Sparrow launcher, but this will be replaced by a 20-mm Phalanx CIWS of the type due to be fitted to all 46 ships. The port pair of the four twin cells of the ASROC launcher have been retrofitted to fire Harpoon SSMs, whilst all vessels are also to be fitted to carry the SQR-18A TACTASS towed-array sonar. In 34 ships it will replace the SQS-35A VDS system carried in a stern well. For helicopter operations an SRN-15 TACAN is carried and the SLQ-32(V)1 ESM system is being upgraded to the SLQ-32(V)2 configuration. To reduce underwater radiated noise the Prairie/Masker bubble system has been used on the hull and propeller. The ASW TDS first evaluated in the 'Garcia' class is being installed as ships enter refit. By 1986 eight units will have been assigned to the Naval Reserve Force as replacements for old World War II destroyers. The class comprises the USS ***Knox*** (FF1052), USS ***Roark*** (FF1053), USS ***Gray*** (FF1054), USS ***Hepburn*** (FF1055), USS ***Connole*** (FF1056), USS ***Rathburne*** (FF1057), USS ***Meyerkord*** (FF1058), USS ***W.S. Sims*** (FF1059), USS ***Lang*** (FF1060), USS ***Patterson*** (FF1061), USS ***Whipple*** (FF1062), USS ***Reasoner*** (FF1063), USS ***Lockwood*** (FF1064), USS ***Stein*** (FF1065), USS ***Marvin Shields*** (FF1066), USS ***Francis Hammond*** (FF1067), USS ***Vreeland*** (FF1068), USS ***Bagley*** (FF1069), USS ***Downes*** (FF1070), USS ***Badger*** (FF1071), USS ***Blakely*** (FF1072), USS ***Robert E. Peary*** (FF1073), USS ***Harold E. Holt*** (FF1074), USS ***Trippe*** (FF1075), USS ***Fanning*** (FF1076), USS ***Ouellet*** (FF1077), USS ***Joseph Hewes*** (FF1078), USS ***Bowen*** (FF1079), USS ***Paul*** (FF1080), USS ***Aylwin*** (FF1081), USS ***Elmer Montgomery*** (FF1082), USS ***Cook*** (FF1083), USS ***McCandless*** (FF1084), USS ***Donald B. Beary*** (FF1085), USS ***Brewton*** (FF1086), USS ***Kirk*** (FF1087), USS ***Barbey*** (FF1088), USS ***Jesse L. Brown*** (FF1089), USS ***Ainsworth*** (FF1090), USS ***Miller*** (FF1091), USS ***Thomas C. Hart*** (FF1092), USS ***Capodanno*** (FF1093), USS ***Pharris*** (FF1094), USS ***Truett*** (FF1095), USS ***Valdez*** (FF1096) and USS ***Moinester*** (FF1097).

Specification

'Knox' class

Displacement: 3,011 tons standard and 3,877 tons (FF1052-FF1077) or 4,250 tons (other ships) full load

Dimensions: length 133.5 m (438.0 ft); beam 14.3 m (46.8 ft); draught 4.6 m (15.0 ft)

Propulsion: geared steam turbines delivering 35,000 hp (26100 kW) to one shaft

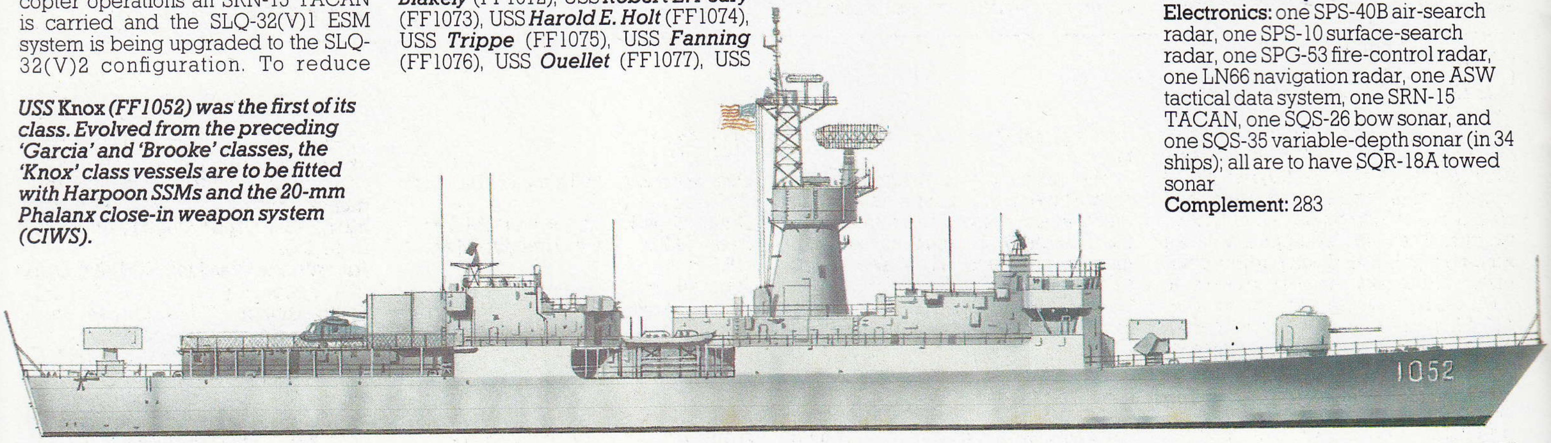
Speed: 27 kts

Armament: one 127-mm (5-in) DP gun, one 20-mm Phalanx CIWS (being fitted), one octuple Sea Sparrow surface-to-air missile launcher with eight missiles (being replaced), one octuple ASROC anti-submarine and Harpoon surface-to-surface missile launcher with 12 ASROC and four Harpoon missiles, and two twin 324-mm (12.75-in) Mk 32 ASW torpedo tubes with 22 Mk 46 torpedoes

Aircraft: one Kaman SH-2F Seasprite LAMPS I helicopter

Electronics: one SPS-40B air-search radar, one SPS-10 surface-search radar, one SPG-53 fire-control radar, one LN66 navigation radar, one ASW tactical data system, one SRN-15 TACAN, one SQS-26 bow sonar, and one SQS-35 variable-depth sonar (in 34 ships); all are to have SQR-18A towed sonar

Complement: 283



USS* Knox *(FF1052) was the first of its class. Evolved from the preceding 'Garcia' and 'Brooke' classes, the 'Knox' class vessels are to be fitted with Harpoon SSMs and the 20-mm Phalanx close-in weapon system (CIWS).

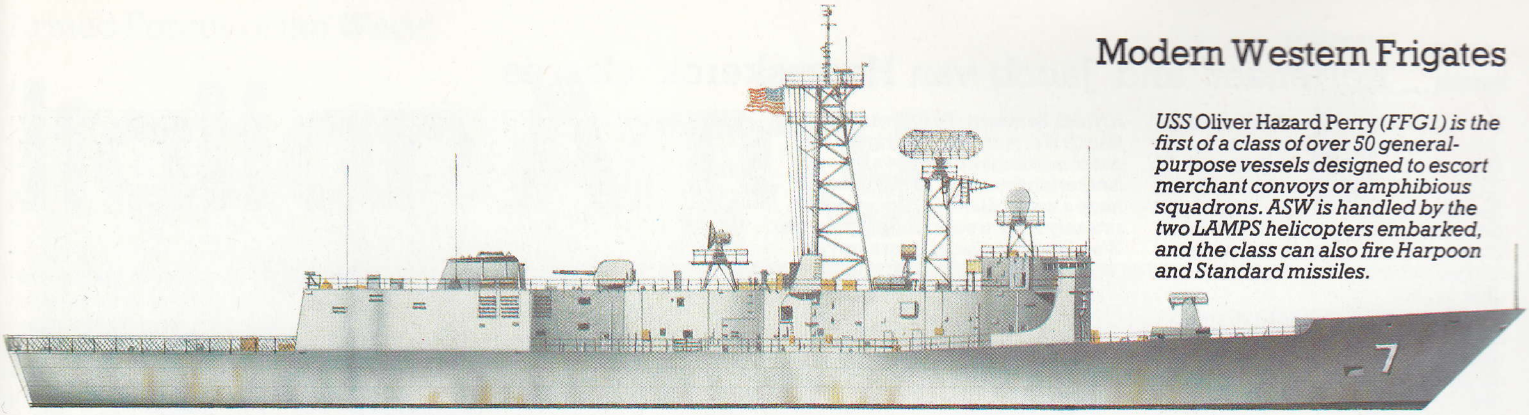
USA

'Oliver Hazard Perry' class

Destined to be numerically the largest warship class in the US Navy, the **'Oliver Hazard Perry' class** was designed for anti-air warfare with ASW and anti-surface warfare as its secondary roles. Because of cost considerations the first 26 will not be refitted to carry two LAMPS III ASW helicopters, but will retain the present two LAMPS I machines. The LAMPS facilities will include the Recovery Assistance, Security and Traversing (RAST) system which will allow the launch and recovery of the Sikorsky SH-60 Seahawk helicopters with the ship rolling through 28° and pitching up to 5°. All have aluminium alloy armour over their magazine spaces and Kevlar plastic armour over vital electronics and communications facilities.

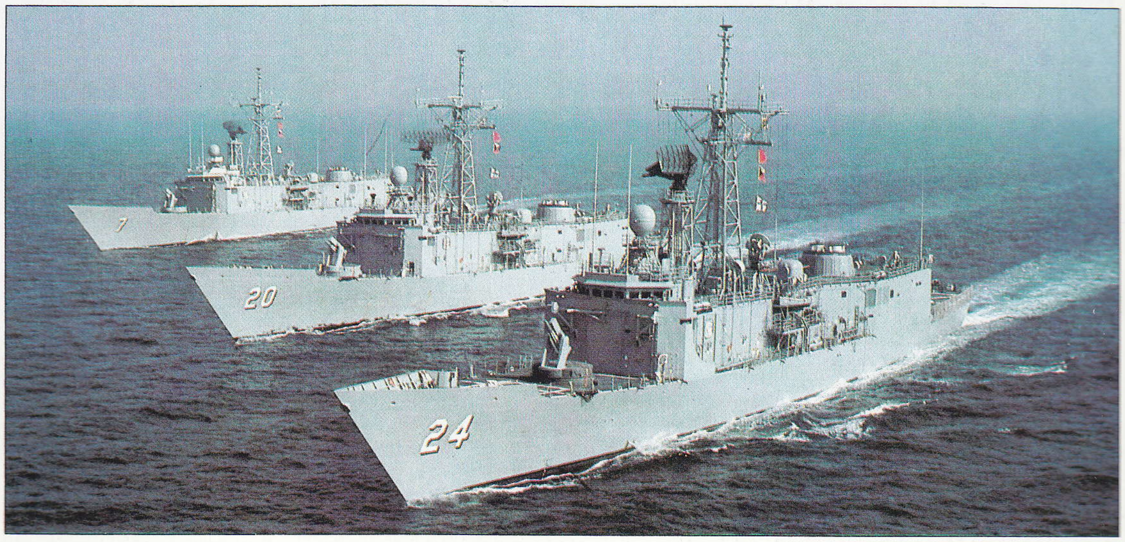
A further four ships are HMAS ***Adelaide*** (F01), HMAS ***Canberra*** (F02), HMAS ***Sydney*** (F03) and HMAS ***Darwin*** (F04) for Australia, which may also construct up to another six under licence. Spain is also building under licence three vessels of the type for her navy: these are the ***Navarra*** (F81), ***Murcia*** (F82) and ***Leon*** (F83).

The magazine for the single-rail Mk 13 SAM launcher can take only Standard and Harpoon missiles, so the shipboard ASW weapons are Mk 46 torpedoes and the LAMPS helicopters. Eighteen of the US class have been assigned to the Naval Force Reserve as training ships along with several 'Knox' class ASW frigates. Under current planning the US Navy will not be ordering any new frigate construction as it has a surplus of such hulls. The class consists of the USS ***Oliver Hazard Perry*** (FFG7), USS ***McInerney*** (FFG8), USS ***Wadsworth*** (FFG9), USS ***Duncan*** (FFG10), USS ***Clark*** (FFG11), USS ***George Philip*** (FFG12), USS ***Samuel Eliot Morison*** (FFG13), USS ***John H. Sides*** (FFG14), USS ***Estocin*** (FFG15), USS ***Clifton Sprague*** (FFG16), USS ***John A. Moore*** (FFG19), USS ***Antrim*** (FFG20), USS ***Flatley*** (FFG21), USS ***Fahrion*** (FFG22), USS ***Lewis B. Puller*** (FFG23), USS ***Jack Williams*** (FFG24), USS ***Copeland*** (FFG25), USS ***Gallery*** (FFG26), USS ***Mahlon S. Tisdale*** (FFG27), USS ***Boone*** (FFG28), USS ***Stephen W. Groves*** (FFG29), USS ***Reid*** (FFG30), USS ***Stark*** (FFG31), USS ***John L. Hall*** (FFG32), USS ***Jarret*** (FFG33), USS ***Aubrey Fitch*** (FFG34), USS ***Underwood*** (FFG36), USS ***Crommelin*** (FFG37), USS ***Curts*** (FFG38), USS ***Doyle*** (FFG39), USS ***Halyburton*** (FFG40), USS ***McClusky*** (FFG41), USS ***Klakring*** (FFG42), USS ***Thach*** (FFG43), USS ***De Wert*** (FFG45), USS ***Rentz*** (FFG46), USS ***Nicholas*** (FFG47), USS ***Vandergrift*** (FFG48), USS ***Robert***



USS Oliver Hazard Perry *(FFG1) is the first of a class of over 50 general-purpose vessels designed to escort merchant convoys or amphibious squadrons. ASW is handled by the two LAMPS helicopters embarked, and the class can also fire Harpoon and Standard missiles.*

G. Bradley (FFG49), USS ***Taylor*** (FFG50), USS ***Gary*** (FFG51), USS ***Carr*** (FFG52), USS ***Hawes*** (FFG53), USS ***Ford*** (FFG54), USS ***Elrod*** (FFG55), USS ***Simpson*** (FFG56), USS ***Reuben James*** (FFG57), USS ***Samuel B. Roberts*** (FFG58), USS ***Rodney M. Davis*** (FFG60) and two unnamed (FFG59 and FFG61).



USS Oliver Hazard Perry *is seen together with USS* Antrim *(FFG20) and USS* Jack Williams *(FFG24). Each is armed with an OTO-Melara 76-mm (3-in) quick-firing gun and a Phalanx 20-mm CIWS.*

Specification

'Oliver Hazard Perry' class
Displacement: 2,769 tons standard and 3,658 tons full load
Dimensions: length 135.6 m (445.0 ft) in LAMPS I ships or 138.1 m (453.0 ft) in LAMPS III ships (FFG8, FFG36-FFG43 and FFG45-FFG61); beam 13.7 m (45.0 ft); draught 4.5 m (14.8 ft)
Propulsion: two General Electric LM2500 gas turbines delivering 40,000 hp (29828 kW) to one shaft
Speed: 29 kts
Armament: one single-rail Mk 13 Standard/Harpoon missile launcher with 36 SM-1MR surface-to-air and four Harpoon surface-to-surface missiles, one 76-mm (3-in) DP gun, one 20-mm Phalanx CIWS, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with 24 Mk 46 torpedoes
Aircraft: two Kaman SH-2F Seasprite LAMPS I or two Sikorsky SH-60B Sea Hawk LAMPS III helicopters
Electronics: one SPS-49 air-search radar, one SPS-55 surface-search radar, one STIR fire-control radar, one URN-25 TACAN, one SLQ-32(V)2 ESM system, two Mk 36 Super RBOC chaff launchers, one SQS-56 hull sonar, and (in FFG36-FFG43 and FFG45-FFG61 only) one SQR-19A towed sonar
Complement: 215

NETHERLANDS

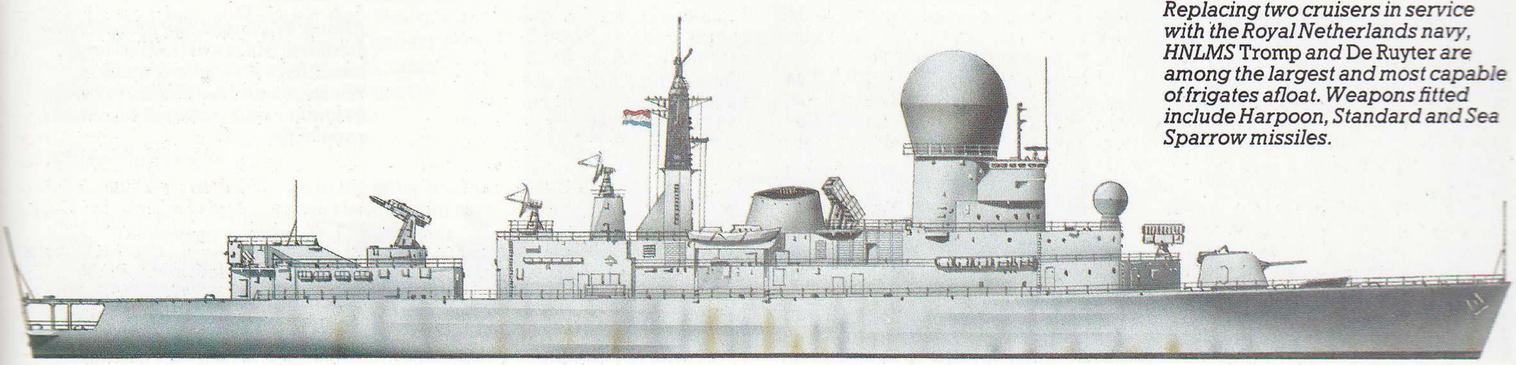
'Tromp' class

Although designated by the Dutch as frigates, the **'Tromp' class** vessels ***Tromp*** (F801) and ***De Ruyter*** (F802) are, by virtue of their armament and size, more akin to guided-missile destroyers. They are equipped with an admiral's cabin and supporting command and control facilities to serve as the flagships of the two Dutch navy ASW hunter-killer groups assigned to EASTLANT control during wartime. Fitted with fin stabilizers, they are excellent seaboats and weapons platforms in most types of weather. The propulsion is of the COGOG type with pairs of Rolls-Royce Olympus and Tyne gas turbines that have been downrated to improve gas generator life and ease of maintenance. A full NBC citadel defence is built into the hull.

The primary role assigned to the ships is the provision of area SAM defence against aircraft and missiles to the hunter-killer group or convoy it may be escorting. They also have a secondary ASW and anti-surface vessel role. The main armament is a single-rail Mk 13 Standard SM-1MR SAM launcher, backed up by an octuple NATO Sea Sparrow SAM launcher with a large reload magazine. The appearance of the vessels is characterized by the large plastic radome fitted over the forward SPS-01 3D radar. A new multi-beam target-acquisition radar, SMART, is under development to replace the SPS-01.

Specification

'Tromp' class
Displacement: 3,665 tons standard and 4,308 tons full load
Dimensions: length 138.4 m (454.0 ft) beam 14.8 m (48.6 ft); draught 4.6 m (15.1 ft)
Propulsion: COGOG arrangement with two Rolls-Royce Olympus TM3B gas turbines delivering 50,000 hp (37285 kW) and two Rolls-Royce Tyne RM1C gas turbines delivering 8,200 hp (6115 kW) to two shafts
Speed: 28 kts
Armament: two quadruple Harpoon surface-to-surface missile launchers with eight missiles, one single-rail Mk 13 Standard surface-to-air missile launcher with 40 SM-1MR missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with 60 missiles, one twin 120-mm (4.72-in) Bofors DP gun, and two triple 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes
Aircraft: one Westland SH-14B/C Lynx ASW helicopter
Electronics: one SPS-01/D radar, two ZW-05 surface-search radars, one WM-25 fire-control radar, two SPG-51C Standard fire-control radars, one SEWACO I data information system, one Sphinx ESM system, two Corvus chaff launchers, one Type 162 hull sonar, and one CWE610 hull sonar
Complement: 306



Replacing two cruisers in service with the Royal Netherlands navy, HNLMS Tromp *and* De Ruyter *are among the largest and most capable of frigates afloat. Weapons fitted include Harpoon, Standard and Sea Sparrow missiles.*

NETHERLANDS

'Kortenaer' and 'Jacob van Heemskerck' classes

The **'Kortenaer'** or **'Standard'** class frigate design was authorized in the late 1960s as the replacement for the 12 ASW destroyers of the 'Holland' and 'Friesland' classes. The propulsion plant and machinery layout was taken from the 'Tromp' design, the power of the gas turbines being kept normal to give higher maximum and cruising speeds in order to permit operations against nuclear submarines. A single pair of fin stabilizers is fitted, and as far as possible internal systems have been automated to reduce crew numbers. Eight ships were ordered in 1974, and a further four in 1976. In 1982, however, two newly completed units were purchased by Greece as the ***Elli*** (F450) and ***Limnos*** (F451). These were replaced in the Dutch order by two vessels to be constructed to an air-defence variant design known as the **'Jacob van Heemskerck'** class. The two ships are the ***Jacob van Heemskerck*** (F812) and ***Witte de With*** (F813), and were planned to alternate as the flagship of the Dutch navy's third ASW hunter-killer group, assigned to NATO's Channel Command in wartime. The helicopter facilities of the 'Kortenaers' has been replaced by a Mk 13 Standard SAM missile launcher. The two vessels will enter service in 1985 and 1986 respectively. The 10 vessels of the ASW class are the ***Kortenaer*** (F807), ***Callenburgh*** (F808), ***Van Kingsbergen*** (F809), ***Banckert*** (F810), ***Piet Hein*** (F811), ***Abraham Crijnssen*** (F816), ***Philips van Almonde*** (F823), ***Bloys van Treslong*** (F824), ***Jacob van Brakel*** (F825) and ***Pieter Florisz*** (F826).

HNLMS Banckert *(F810) was the fourth 'Kortenaer' class frigate to enter service with the Royal Netherlands navy. The 'Kortenaers' have a well-balanced armament fit, primary ASW weapons being the two Westland Lynx helicopters carried.*

Specification

'Kortenaer' class

Displacement: 3,050 tons standard and 3,786 tons full load
Dimensions: length 130.5 m (428.1 ft); beam 14.6 m (47.9 ft); draught 4.3 m (14.1 ft)
Propulsion: COGOG arrangement with two Rolls-Royce Olympus TM3B gas turbines delivering 51,600 hp (38478 kW) and two Rolls-Royce Tyne RM1C gas turbines delivering 9,800 hp (7308 kW) to two shafts
Speed: 30 kts
Armament: two quadruple Harpoon surface-to-surface missile launchers with eight missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with 24 missiles, one 76-mm (3-in) DP gun, one 30-mm Goalkeeper CIWS, and two twin 324-mm (12.75-in) Mk 32 ASW torpedo tubes with Mk 46 torpedoes
Aircraft: two Westland SH-14B/C Lynx ASW helicopters
Electronics: one LW-08 air-search radar, one ZW-06 navigation radar, one WM-25 fire-control radar, one STIR fire-control radar, one SEWACO II data information system, one Sphinx (F807-F811) or Ramses (others) ESM system, two Corvus chaff launchers, and one SQS-505 bow sonar
Complement: 176 normal and 200 maximum

Specification

'Jacob van Heemskerck' class

Displacement: 3,000 tons standard and 3,750 tons full load
Dimensions: as 'Kortenaer' class
Propulsion: as 'Kortenaer' class
Speed: as 'Kortenaer' class
Armament: as 'Kortenaer' class without 76-mm (3-in) DP gun but with one single-rail Mk 13 Standard surface-to-air missile launcher with 40 SM-1MR missiles
Aircraft: none
Electronics: one SMART 3D radar, one ZW-06 navigation radar, one STIR fire-control radar, two Mod STIR fire-control radars, one SEWACO II data information system, one Ramses ESM system, four Mk 36 Super RBOC chaff launchers, and one PHS36 bow sonar
Complement: 176 plus 20 flag staff

BELGIUM

'Wielingen' (E-71) class

The **'Wielingen' class** is the first post-war warship type to be completely designed and built in Belgium. The programme was approved in June 1971, the final studies being completed in July 1973. The order for the first two ships was placed in October of that year, and the hulls were laid down in 1974. The remaining two were laid down in 1975, all four units commissioning into the Belgian navy in 1978.

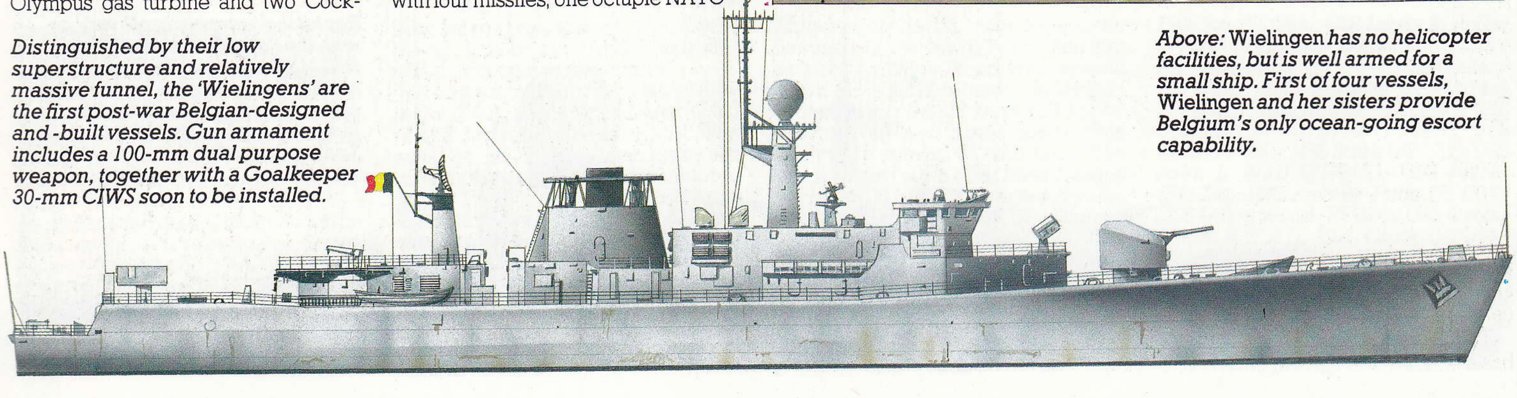
Based at Zeebrugge, the four vessels are the largest surface warships in the Belgian navy and form its only sea-going escort ship element. They are fully air conditioned, and are fitted with Vosper fin stabilizers and a Westinghouse hull sonar. The armament and sensor fit is from a wide variety of NATO countries and was chosen to make the class as well-armed as possible for so compact a size. For economy a combined diesel or gas turbine (CODOG) machinery outfit was installed using a single Rolls-Royce TM3B Olympus gas turbine and two Cockerill CO-240V-12 diesels to drive two shafts fitted with controllable-pitch propellers. The four vessels built are the ***Wielingen*** (F910), ***Westdiep*** (F911), ***Wandelaar*** (F912) and ***Westhinder*** (F913), and these will remain in operational service until the early years of the next century.

Specification

'Wielingen' class

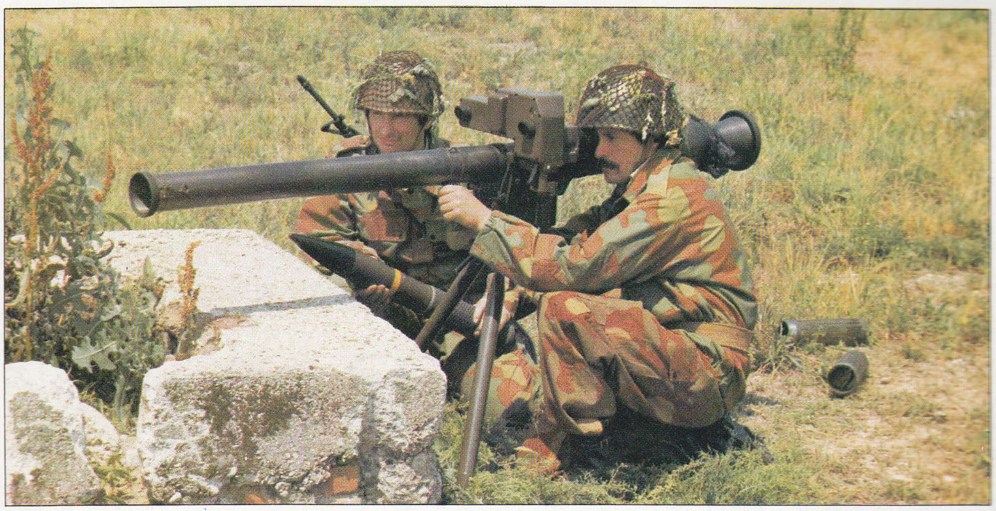
Displacement: 1,880 tons standard and 2,283 tons full load
Dimensions: length 106.4 m (349.1 ft); beam 12.3 m (40.4 ft); draught 5.6 m (18.4 ft)
Propulsion: CODOG arrangement with one Rolls-Royce Olympus TM3B gas turbine delivering 28,000 shp (20880 kW) and two diesels delivering 6,000 hp (4474 kW) to two shafts
Speed: 29 kts
Armament: four single MM.38 Exocet surface-to-surface missile launchers with four missiles, one octuple NATO Sea Sparrow surface-to-air missile launcher with eight missiles, one 100-mm (3.9-in) DP gun, two single 20-mm AA guns (to be replaced by one 30-mm Goalkeeper CIWS), one sextuple 375-mm (14.76-in) Creusot Loire ASW rocket-launcher, and two single ASW torpedo catapults with 10 L5 torpedoes
Electronics: one DA-05 air- and surface-search radar, one WM-25 fire-control radar, one TM1645/9X navigation radar, one SEWACO IV tactical data system, two Mk 36 Super RBOC chaff launchers, one SLQ-25 NIXIE ASW decoy system, and one SQS-505A hull sonar
Aircraft: none
Complement: 160

Above: *Wielingen* ***has no helicopter facilities, but is well armed for a small ship. First of four vessels,*** *Wielingen* ***and her sisters provide Belgium's only ocean-going escort capability.***



Distinguished by their low superstructure and relatively massive funnel, the 'Wielingens' are the first post-war Belgian-designed and -built vessels. Gun armament includes a 100-mm dual purpose weapon, together with a Goalkeeper 30-mm CIWS soon to be installed.

Italian Army



Although a large, professional force, lack of up-to-date equipment remains a major problem for the Italian army. Pictured here is the Folgore anti-tank system, currently under field tests, which is one of the few new weapons the army may be receiving.

Italy was one of the founder members of NATO, and the Italian army has a current strength of 258,000, of whom 187,000 are conscripts serving a 12-month period of service. To back them up the army's reserves total 545,000 and yet more manpower is provided by the Carabinieri, who number over 90,000, and by the Public Security Guard and the Finance Guard. The army has its own integral aviation units and is divided into two main formations, the Field Army (Esercito di Campagna) and the Territorial Army (Force per la Difesa Interna del Territorio).

On paper Italy should be a powerful military nation, but in reality fields one of the weakest of all the NATO land powers. The reasons for this are several and varied, many of them derived from the tortuous nature of the Italian constitution and political scene, and also from the overall weak state of the Italian economy. Thus although the army appears to be strong its numbers are deceptive, for many of the units are understrength and poorly equipped by present standards. Some of the equipment in use in Italy is first class, but much more is now rapidly being rendered obsolescent at best, and there appears to be little chance of any large-scale procurement of new equipment in the foreseeable future.

The Field Army

The Commando Designato 3° Armata is organized into three corps, most of their units being located in the north of the country and along the border with Yugoslavia. The three corps (III, IV and V) consist of one armoured division (the Divisione Corazzata 'Ariete'), three mechanized divisions, two independent mechanized brigades, four independent motorized brigades, five alpine brigades (Alpini, all centred within IV Corps), one airborne brigade, one amphibious group and one missile brigade.

Internal reorganizations have recently been effected to make the best possible use of the defence funds available, and these have now led to an overall reduction in the number of brigade-sized units. In effect this has regrouped a number of mainly understrength formations into more effective groupings that now carry out their own internal training. (Special training regiments were used before this.)

The Territorial Army

The Territorial Army is responsible for recruiting, mobilization and general internal security and internal defence, although in some categories of the latter its responsibilities overlap with some of the other Italian internal police and paramilitary forces. It has five regional commands but only four operational formations. Each of these is an infantry brigade, and these are based at Florence, Bari, Bologna and Palermo. These brigades each have a two-battalion infantry regiment, a two-company tank battalion, a field artillery regiment, signals and engineer companies and an aviation flight.

The Carabinieri

The Carabinieri are legally part of the army and not only provide the military police for the army but also a strong mechanized brigade of 13 battalions, an airborne battalion and two cavalry squadrons. It is an all-regular force armed with M47 tanks, armoured cars and armoured personnel carriers.

To add to this internal security force, for that is basically what the Carabinieri are, there is the Public Security force, whose men live in and operate from barracks that come under the control of the Ministry of the Interior. They have a strength of 68,000 and are equipped with armoured cars, armoured personnel carriers and helicopters. The Ministry of Finance has its own 50,000-strong Guardia di Finanza equipped with helicopters and patrol craft to combat smuggling, and if all these were not enough there is also the Public Security Police who intervene during public disorders. Somewhere within this structure come the Vigili Urbani, the municipal civil police.

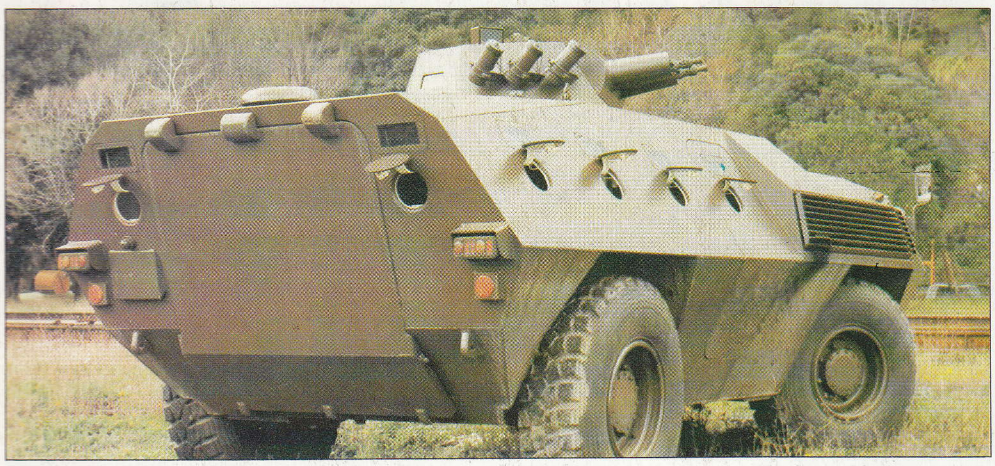
Equipment

Italy is an industrialized country, but is devoid of virtually any industrial raw materials. This alone limits the amount of equipment that can be produced locally for military use. Despite this Italy has a thriving armaments industry that produces all manner of weapons ranging from tanks to small arms and ammunition. However, a closer examination reveals that much of the Italian army's equipment is imported, mainly from the United States, and that much of the heavier locally-produced matériel is licence-produced or derived from an imported design. One example of the latter is the locally-produced IAFV armoured personnel carrier, a local variation of the US M113.

Italy does produce some indigenous heavy weapons, typical of which is the new 155-mm (6.1-in) howitzer now about to be retrofitted to all army M109 self-propelled howitzers. Italy is also involved in the international 155-mm (6.1-in) FH-70 howitzer programme (the army has some 150 FH-70s with a further 140 on order) and the SP-70 programme, and is in the early stages of involvement in the NATO/American MLRS programme. The local ammunition industry provides the bulk of the army's requirements, and there is a relatively small but thriving electronics industry.

Infantry debus from an M113 APC while an M47 tank drives on ahead. The army also uses various M113 derivatives like the M106 mortar carrier; some M113s are made in Italy under licence and some bought direct from Ford.

12 PASS



The Fiat/OTO Melara Type 6614 is used by Italian paramilitary forces. Carrying a crew of 11 and armed with a 12.7-mm (0.5-in) machine-gun, it has been widely exported and is built under licence in South Korea.

The Italian army works closely with local industry, to the extent that OTO Melara produced a howitzer designed by the army to meet its own requirements. This was the 105-mm (4.13-in) Model 56 pack howitzer which became one of the most successful of all post-war light artillery designs. The army also laid down the requirements for the current in-service automatic rifle, the BM59, which is a version of the American Garand rifle produced in Italy by Beretta SpA.

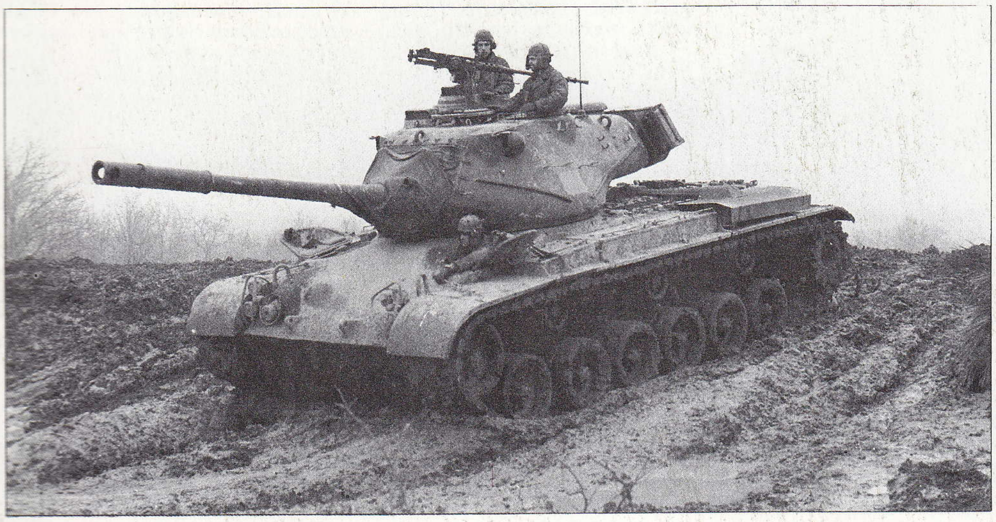
The standard Italian MBT is the West German Leopard 1, many of which were built in Italy by OTO Melara. The number involved, including specialized variants, will eventually reach 920, and there seems no prospect that the OTO Melara OF40 MBT will be procured by the army. Other MBTs include 550 M47s, some of which have now been sold to Spain, and some 300 M60A1s.

The Italian artillery arm is strong, and headed by a Lance long-range missile battalion; the rest of the single missile brigade is made up of 40 Improved HAWK SAMs organized into three battalions. One figure quoted is that the army has 1,116 artillery pieces, of which 320 are 105-mm (4.13-in) pack howitzers. 155-mm (6.1-in) howitzers of all types number 724, of which 220 are self-propelled M109s; another batch of M109s is on order. Other self-propelled weapons include 36 M107 175-mm (6.89-in) guns and 36 203-mm (8-in) howitzers. The SP-70 is in prospect after 1988.

In anti-tank weapons, the Italian army is one of the last European homes of the 106-mm (4.17-in) recoilless gun, but this is gradually being supplanted by imports of TOW (870 are currently on order) and Milan guided missiles. Numbers of SS.11 and Cobra missiles are still in service.

Armoured personnel carriers include numbers of M113s (with more currently on order) along with smaller quantities of M106s, M548s and M578s to an APC total of 4,200 including a quantity of French AMX-VCIs. The paramilitary formations use a variety of armoured vehicles including Fiat 6616 and 6614 armoured cars, along with some old American relics such as M6s and M8s.

Although Italy is slowly increasing its force of Leopard I MBTs, the venerable M47 soldiers on. Totally outclassed by modern armour, OTO Melara is currently testing an updated M47 with a new engine, new transmission and 105-mm (4.13-in) gun.



Operations and recent years

The Italian army has not been in action since World War II, but in recent years small detachments of the total force have been involved in United Nations operations, the most recent of them the deployment of some infantry units to Lebanon, where they acquitted themselves well and managed to withdraw when required without the casualties inflicted on the other peace-keeping contingents.

No Italian army units now operate outside national territory, although one Alpini battalion forms part of the NATO ACE Mobile Force and frequently trains outside Italy.

Recent years have seen an increase in internal trouble within Italy, however, and the army has not remained remote from this. Although the Field and Territorial Armies have not been much involved in the internal strife caused by political and economic upheavals, the Carabinieri and the other paramilitary forces certainly have played a part, and the involvement of the Carabinieri in the defeat of the 'Red Brigade' terrorist groups has been one of the force's major achievements in recent years. Unfortunately the army has a long history of involvement in internal politics, and during the late 1960s it was under heavy suspicion of planning a coup d'etat. The political aftermath of that era still has its effects on relations between the state and the army.

The economic condition of Italy has recently enforced the internal reorganization of the army already mentioned. The manpower strengths maintained by the use of a conscript force still cause inordinate funding expenditure on manpower and associated facilities, to the extent that only some 15 per cent of any budget is left for new equipment or updating. In recent years the number of conscripts has been substantially reduced and the new organization has settled down.

The three corps of the Field Army are now located at Milan, Bolzano and Vittorio Veneto, all in the north along with the bulk of the combat units of the Field Army. Only one division of the Field Army is located to the south, and that is the Divisione 'Granatiere di Sardegna', which is based around Rome. Among the more specialized formations, the missile brigade is located at Portogruaro, and the 'Folgore' parachute brigade at Pisa. The 'Lagunari' amphibious brigade is at Venice and a special Field Army battle group is based at nearby Trieste for possible border operations. The five alpine brigades now have a 'normal' as opposed to their specialized mountain warfare role (which will still be maintained). The five brigades are the 'Taurinese' (Turin), 'Orobica' (Bolzano), 'Tridentina' (Bressanone), 'Cadore' (Belluno) and 'Julia' (Cividale).

The mobile organization of the Carabinieri has three infantry regiments formed from 11 battalions plus a parachute battalion (part of the 'Folgore' brigade) and an armoured regiment based in Rome. The territorial organization of the Carabinieri has three divisions (Milan, Rome and Naples) which control nine brigades which in turn control 24 formations known as legions.

Order of battle

three corps headquarters
one armoured division (two armoured brigades and one mechanized brigade)
three mechanized divisions (each with one armoured brigade and two mechanized brigades)
two independent mechanized brigades
four independent motorized brigades
five alpine brigades
one airborne brigade
two amphibious battalions
one missile brigade (one Lance battalion and three Improved HAWK battalions)

Army aviation

four wings (10 squadrons with 29 flights)
10 independent squadrons (21 flights)
19 light aircraft and helicopter squadrons (eight fixed- and 11 rotary-wing)
10 helicopter reconnaissance squadrons
two target-acquisition squadrons (one light aircraft and one helicopter)
17 multi-role helicopter squadrons
four medium transport helicopter squadrons
one training squadron
four repair units.